

The New Tractor Appeal to Car Dealers

GENERAL LIBRARY
MAR 10 1919
UNIV. OF MICH.

Engineering
Library

MOTOR AGE

Volume XXXV
Number 10

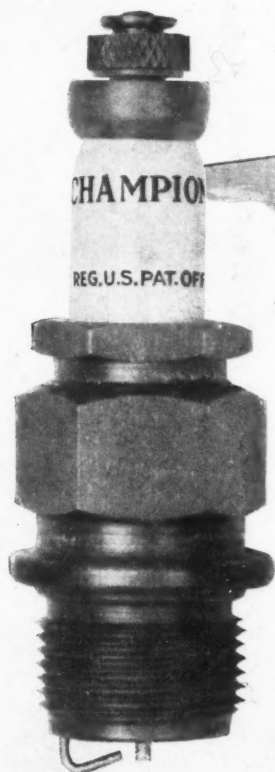
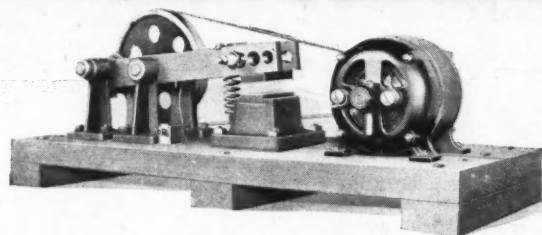
PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, MARCH 6, 1919

Fifteen Cents a Copy
Three Dollars a Year



Champion

Dependable
Spark Plugs



Champion
7/8-18
Price \$1.00

Withstand Shocks of 300 Sledge Hammer Blows Per Minute

THE "shock test," which the Champion Spark Plug must survive without injury, is the equivalent to a weight of 3½ pounds, dropping with the rapidity of 300 times per minute.

The qualities that enable Champion Spark Plugs to successfully withstand such severe trials are largely a result of

ten years' study and experimenting that developed our patented gasket construction and our Number 3450 Insulator.

Dealers know this No. 3450 Insulator is one of the several reasons why Champion Spark Plugs are more durable and dependable than ordinary spark plugs and why they sell better.

Champion Spark Plug Company, Toledo, Ohio
Champion Spark Plug Co., of Canada, Limited, Windsor, Ontario



Pass 'Em On the Hills

It's carbon that steals the power of an engine—causes that knock—and retards hill climbing. The secret of a powerful motor that can take hills and pull through mud and sand on high is cleanliness.

Don't wait until your motor is choked with carbon—remove it every week or two with Johnson's Carbon Remover. You can do it yourself in five minutes—no mechanical experience necessary.

JOHNSON'S CARBON REMOVER

A dose of Johnson's Carbon Remover—the engine laxative—will cure 80% of engine troubles. It will increase the power of your car—improve acceleration—stop that knock—quiet your motor—save your batteries—cut down your repair bills—and reduce your gas and oil consumption.

Absolutely Harmless

Johnson's Carbon Remover is a harmless liquid to be poured or squirted into the cylinders. It contains no acids and does not effect lubrication or interfere with the oil in the crank case. Millions of cans have been used. Recommended by many of the leading car manufacturers including the Packard and Studebaker Companies.

Use It Every 500 Miles

The regular use of Johnson's Guaranteed Carbon Remover, giving carbon no chance to accumulate, will automatically eliminate most valve trouble and keep your motor clean, sweet and at its highest efficiency. You will save \$3.00 to \$5.00 over any other method of carbon removal without laying up your car and with much better results.

Send for our booklet on "Keeping Cars Young" — It's free.

S. C. JOHNSON & SON, Dept. MA, Racine, Wis.

MOTOR AGE

Published Every Thursday by
THE CLASS JOURNAL COMPANY

MALLERS BUILDING
59 E. Madison St., CHICAGO

HORACE M. SWETLAND, Pres. W. I. RALPH, Vice-Pres.
E. M. COREY, Treas. A. B. SWETLAND, Gen. Mgr.
Member Audit Bureau of Circulations; Member Assoc. Business Papers, Inc.

Vol. XXXV Chicago, March 6, 1919 No. 10

CONTENTS

Copyright 1919 by THE CLASS JOURNAL COMPANY

Kansas City Tractor Show.....	7
Opening of Aeronautical Show.....	12
Taxes on Motors.....	13
Editorial.....	14
Sell Your Organization.....	15
Road Funds Available.....	16
S. A. E. at Kansas City.....	18
Exports of Motors.....	21
Packard Airplanes.....	22
Selling Accessories.....	24
Wiring Diagram Chart.....	26
Electrical Equipment.....	28
Monthly Passenger Car Tables.....	38
Development.....	42
Campbell Transmission, Eco Air and Water Station and Grid Iron Grip Described and Illustrated.	

DEPARTMENTS

Readers' Clearing House.....	30
Motor Car Repair Shop.....	41
Service Equipment.....	44
Accessory Corner.....	45
Among the Makers and Dealers.....	46
From the Four Winds.....	48

Advertisers Index—Next to Last Page

MOTOR AGE

MALLERS BUILDING
CHICAGO

Phone Randolph 6960
Cable Address "Motage"

DAVID BEECROFT
Directing Editor

E. E. HAIGHT, Manager

DARWIN S. HATCH
Managing Editor

BRANCH OFFICES

DETROIT, 95 Fort St., W. CLEVELAND, 536-540 Guardian Bldg.
Phone Main 1351 Phone Main 1142

NEW YORK CITY, U. P. C. Bldg., 231-241 W. 39th St.
Phone Bryant 8760

PHILADELPHIA, Widener Bldg., Phone Walnut 2727

SUBSCRIPTION RATES

United States, Mexico and U. S. Possessions..	\$3.00 per year
Canada.....	5.00 per year
All Other Countries in Postal Union.....	6.00 per year
Single Copies.....	15 cents

Entered as second-class matter, September 19, 1899, at the
Post Office, Chicago, Illinois, under Act of March 3, 1879.

Owned by UNITED PUBLISHERS CORPORATION, 243 W.
39th St., New York, H. M. Swetland, Pres.; Charles S. Phillips,
Vice-Pres.; W. H. Taylor, Treas.; A. C. Pearson, Secretary.

"NORMA" PRECISION BALL BEARINGS

(PATENTED)



A few cents "saved" on the cost of a part costing a few dollars may cause the failure of a machine costing thousands of dollars. It is no unusual thing, in mechanisms, to find a major responsibility resting upon a minor part. From which it appears that there is no such thing as a "minor" part.

"NORMA" Bearings are among the smallest parts in the smallest items of equipment used on cars, trucks, tractors, power boats, and airplanes. And their proved capacity for maximum service has made them the standard bearings in practically all ignition apparatus and lighting generators internationally identified with maximum-duty automotive units.

Be SURE. See that your
Electrical Apparatus is
"NORMA" Equipped.

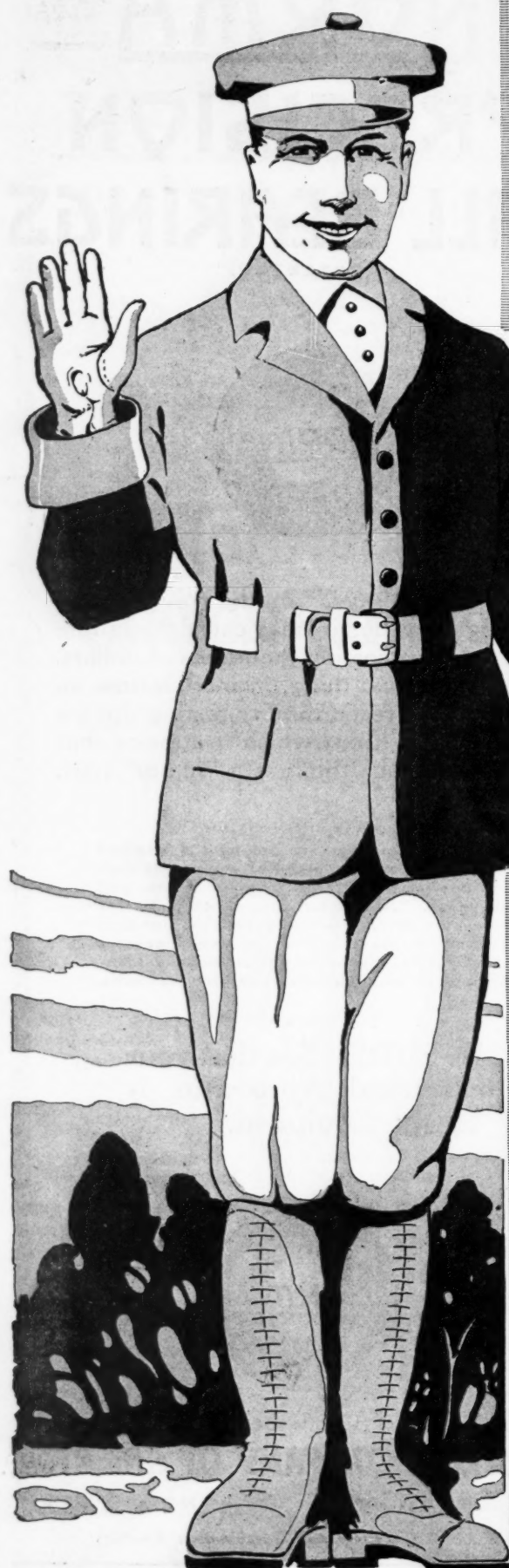


THE NORMA COMPANY OF AMERICA

1790 BROADWAY

NEW YORK

Ball, Roller, Thrust and Combination Bearings



Watch for Me in the Magazines

During 1919 you'll find me in Collier's, Literary Digest, American, Everybody's, Red Book and Cosmopolitan telling car owners about the advantages of the Hood Extra Ply Tires.

You'll surely be interested in these talks, too, for they are straightforward and convincing—moreover, you'll find it well worth while to read them carefully for they are sure to start a train of thought in the tire user's mind which will lead him straight to the nearest Hood Dealer.

Don't you think it would be good business to prepare to sell the tire about which those who have used it say—"Put on a Hood today—forget it for a year?"

Information about the Hood Tire Dealer's proposition will gladly be sent you on request.

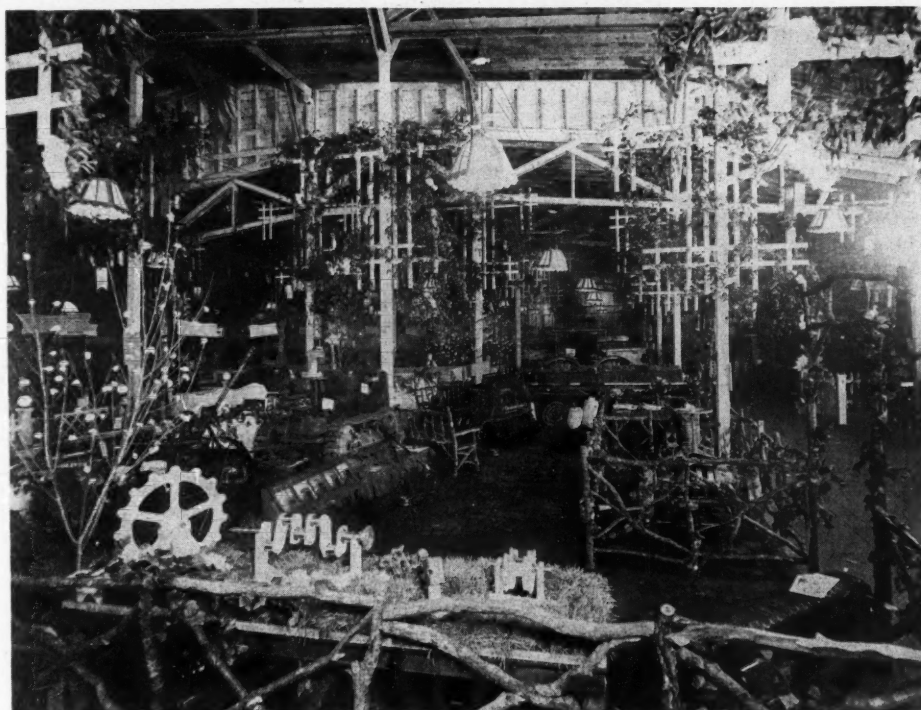
**Put on a Hood Today
Forget It for a Year**



**You Can Buy
HOOD TIRES
at This Sign**

HOOD TIRE CO., Inc.
WATERTOWN, MASS.

MOTOR AGE



Here is a corner of the National Tractor Show, the biggest event of the kind ever held in this country or elsewhere

Tractors Easier to Run and Sell

This Is Message of Kansas City Show
to Dealers of Country

TRACTORS have a new appeal for the automotive dealer. Tractor dealers this year have in the models developed for this season machines which should be easier-selling propositions and ones which will require less expense for service. Those dealers who had an opportunity to study the tractors on exhibition at Kansas City last week were impressed with the general movement among established manufacturers toward improved operation from the standpoint of the farmer—a feature which should go far toward reducing sales resistance.

A more decided step, however, was made in the direction of increasing the wearing qualities of the machine and making easier such replacements and adjustments as become necessary with use.

One of the things which seem to have been impressed most strongly upon the manufacturers, as indicated in changes in-

By Darwin S. Hatch

Managing Editor Motor Age

troduced this year by factories whose products have been on the market for some time, is the necessity of protecting the wearing parts of the mechanism from dust. In most cases this increased protection has been provided either by improvements in methods for removing dust from the intake air to the carburetor and for preventing the entrance of dirt and the retaining of lubricant about the chains or gears which form the final drive to the driving wheels.

Air cleaners are not a new feature on tractors. In fact, they have become almost universal. Nevertheless there are certain changes in the cleaners themselves or in the attachment. The Cleveland has added a sediment chamber to the carburetor, by

which water or dirt in the fuel may be removed more easily. Air cleaners of improved type appear this season on the Heider. The Fordson air cleaner is provided with a heavier float to improve its operation.

Inclosure of the final drive parts by a housing which retains the lubricant and keeps out the dust is a feature part of the design in the Nilson. In the Senior model the chains are covered by a case and better method of lubrication provided. On the newer Junior model the chain guard is so arranged that a portion of it may be taken off to permit better access to the gearset. The new Parrett model E has an internal gear drive which is wholly inclosed and operates in oil. The final drive on the Wisconsin is inclosed for the first time and now operates in a dust- and oil-proof housing.

Increase in accessibility by some means or other has not been confined to the Nilson

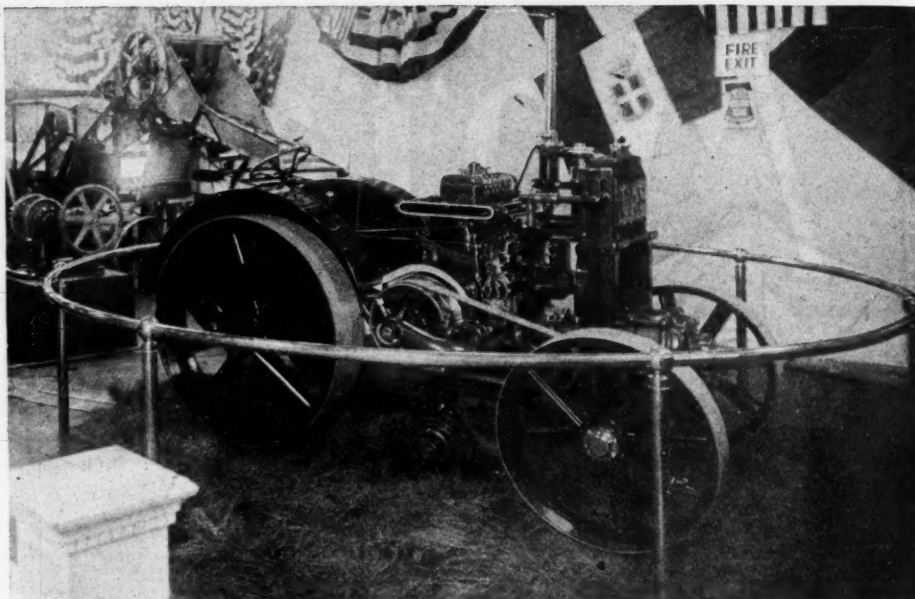
mentioned above. In the new Twin City design this has been made a special point of study. Arrangements have been made for easy removal and replacement of all wearing surfaces of the engine. Wear in the cylinders even is cared for by removable cylinder sleeves, which are easily replaceable. Removable bushings are used throughout the engine. The removable head feature of this engine makes it possible even to change the compression for a variation in altitude or in fuel.

Tension on Fan Belt

Less difficult adjustments comprise another of the changes quite general among the newer models. The Twin City, as are some of the others, is provided with an adjustable tension on the fan belt. This is particularly valuable on a tractor in which the belt is likely to get wet and contract with later stretching and slipping in use, provided no means of adjusting for a variation in belt length are made. The Bates has a spring fan belt tightener which is new this year. The new Moline-Universal is provided with a removable plate on the manifold heater so the accumulation from the exhaust may be cleaned out more readily.

Developments designed to improve the lubrication and keep out the dust from wearing parts all are instrumental in improving the operation of the tractor as a whole, lengthening its life and reducing the necessity of repairs. In many small ways have the manufacturers made slight changes which lengthen the life of individual parts. On the Fordson, for instance, the fan pulley previously had a collar upon which the fan belt at times would ride, causing it to break. Simply removing this collar lengthened the life of the fan belt considerably without decreasing the effectiveness of the pulley.

The fan drive on the new Sandusky is a belt instead of a chain, as on the older one.



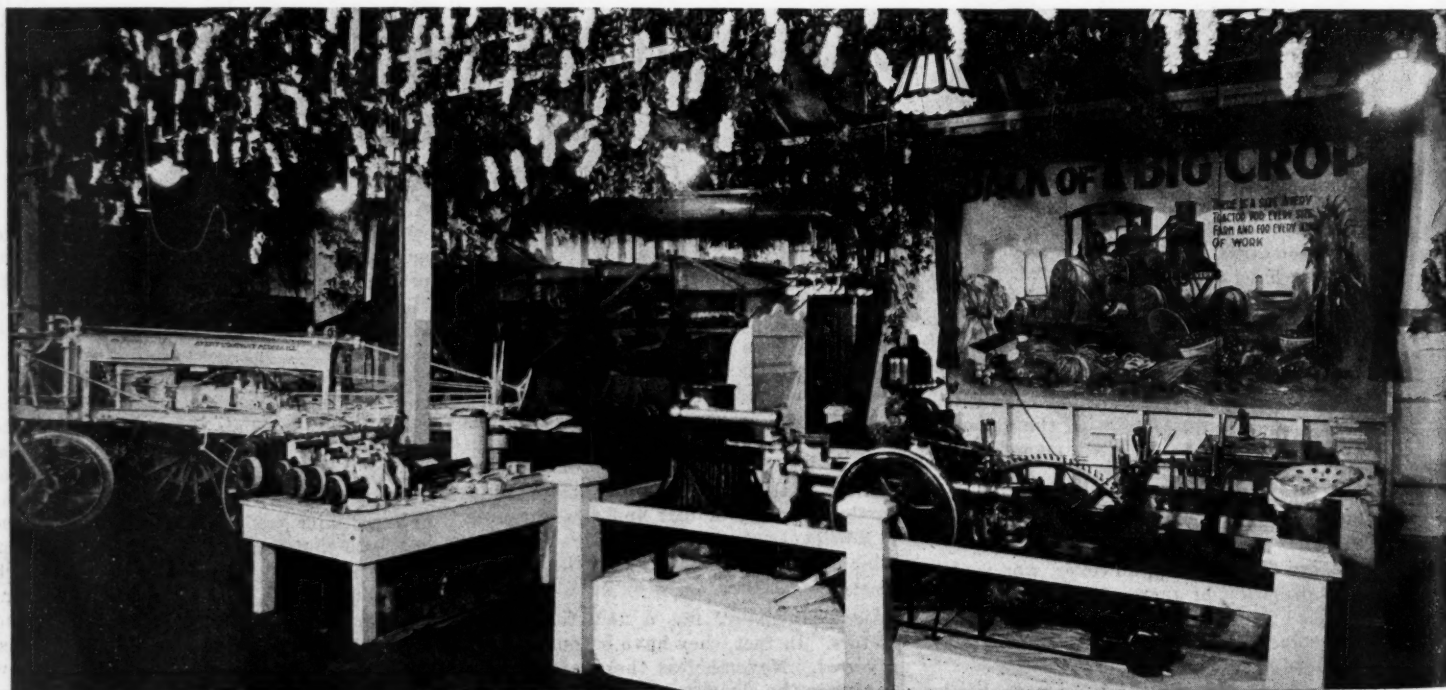
This cutaway Case is so arranged that it revolves and as it revolves the inner mechanism is at work

because with the location of driving and driven pulleys the belt would operate without climbing as the chain has a tendency to do. The engine of the Frick was changed completely, a four-cylinder engine being employed now instead of the two-cylinder. This probably will provide a steadier and better balanced powerplant with less vibration than the previous one.

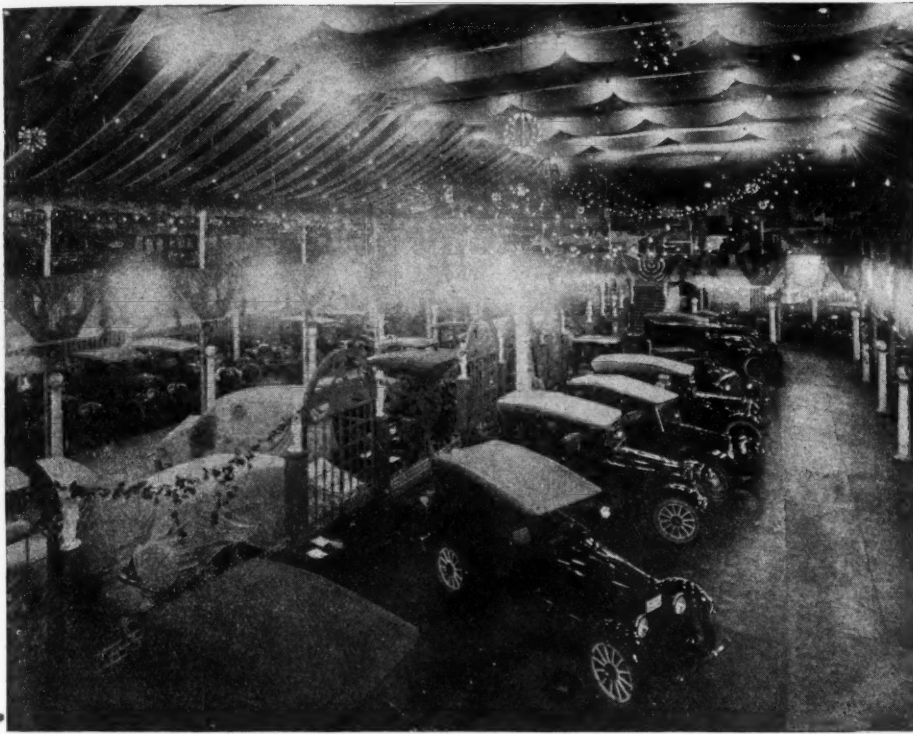
Considerable has been accomplished in the way of improvements in handling the fuel. Most of the tractors have to operate on kerosene and to approach complete combustion as near as may be is a problem which engages the attention of all tractor designers. The men who developed the new Twin City find that with the use of

four valves per cylinder, as they are doing, much more heat is provided for the manifold so that better results are obtained with kerosene than with the same engine having the conventional two valves per cylinder. They explain this by the fact that the great area opened by two exhaust valves permits a much quicker expulsion of the exhaust gas so that it reaches the walls of the intake manifold at higher temperature than is otherwise possible.

An intake manifold of a decided ram's horn type with long easy curves, together with thermostatic regulation of the flow of the cooling water, are additional features of the Twin City design which should improve the handling of kerosene on this



Every model in the Avery line is included in this exhibit, largest, the seventh. The treatment is typical of that



General view of the motor car show held during the tractor show

tractor. The variation in heat requirements of kerosene as compared with gasoline is such that the provision of sufficient heat for kerosene gives too much for full power when gasoline is used. By putting a valve in the manifold heating arrangement of the Sandusky, so as to decrease the heat when gasoline is used, the performance on kerosene was not decreased but a gain of $2\frac{1}{2}$ per cent in power was obtained on gasoline.

The use of water with kerosene is an idea that has been tried out a number of ways. This has been a feature of the Bates and the Rumely. An improvement on the

former this year has been in the control of this water that is fed in with the kerosene, so that it can be regulated from the seat and is used normally only when operating at or near full load.

Improvement in operation, by which the tractor can be handled with less effort and greater certainty of results, is a development which is looked for every year. This season manufacturers have made numerous minor improvements to this end. The gear-shift on the Nilson Junior has been made easier in operation than it was on the model it succeeded.

A rod and lever control for the spark and

throttle and the two-way fuel valve have been provided instead of the piano wire connection previously employed. The Twin City has provided a connection for an engine speed indicator which Waltham is developing and which should do much toward assisting the operator to keep the speed of the engine to the point of maximum pulling power. Moline now provides a pressure gage on the oiling system by which the operator can be assured that the proper oil pressure exists. Moline also provides as an extra this year a friction clutch pulley for belt work.

Third Gear Ratio

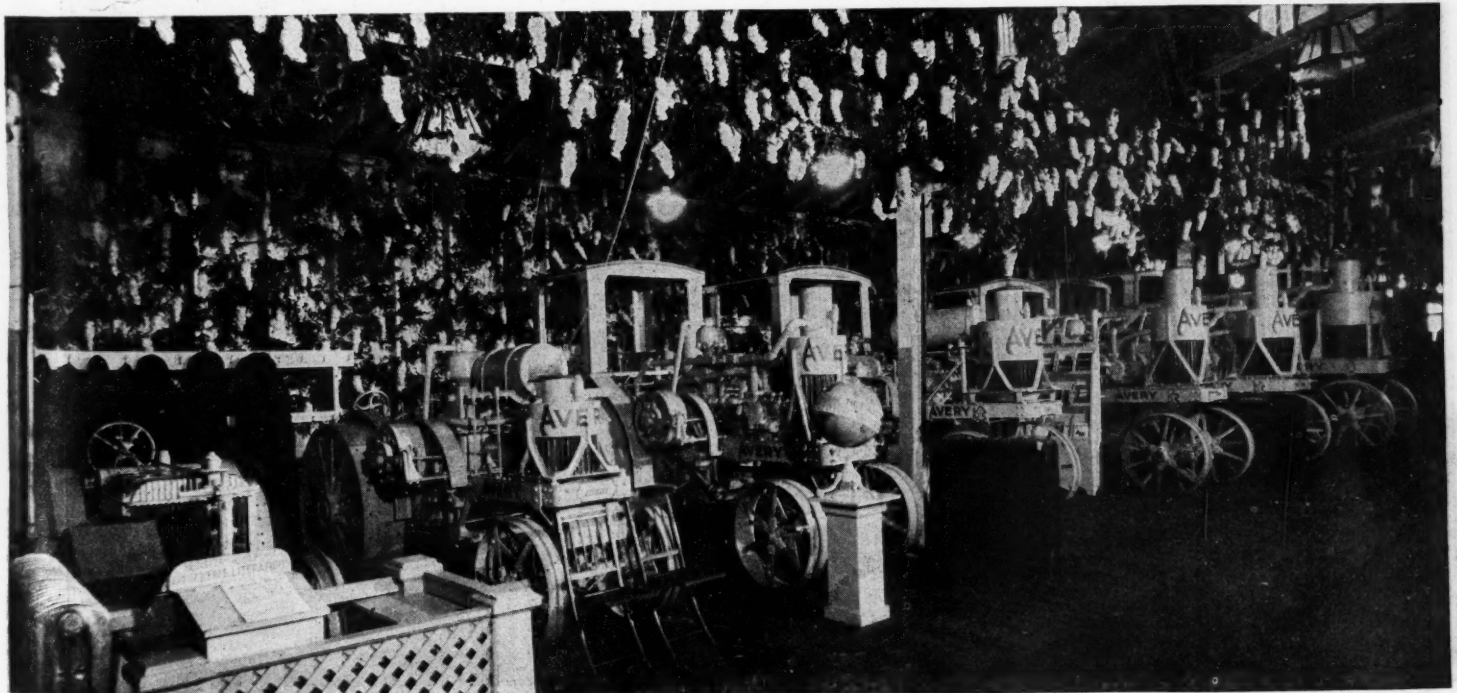
A lower speed than that provided in the past is added in the Parrett by a third gear ratio of $1\frac{1}{4}$ m.p.h. to give greater pulling effort in emergencies. The normal plowing ratio gives a speed of $2\frac{3}{4}$ m.p.h.

Along with its change to two front wheels instead of a single front wheel, the La Crosse tractor now is provided with an attachment for distance control of the tractor from the seat of the drawn implement. The practicability of this line drive was demonstrated when a La Crosse tractor was driven into Kansas City last week from Alton, Ill., hauling two wagons and being operated from one of them.

Methods of attachment of the implements to the tractor have been improved in several instances. The Bates has a new chain hitch and the Cleveland has improved its hitch, as have some of the others.

Strengthening of parts from a general structural standpoint is noticeable in many of the newer designs. The Nilson water pump has a much more rigid support than previously, eliminating tendency to misalignment. The Wallis has had more minor structural refinement, such as the strengthening of the spider and the installation of clamps on the crankcase cover. In three or four instances improvements of the seats have been made.

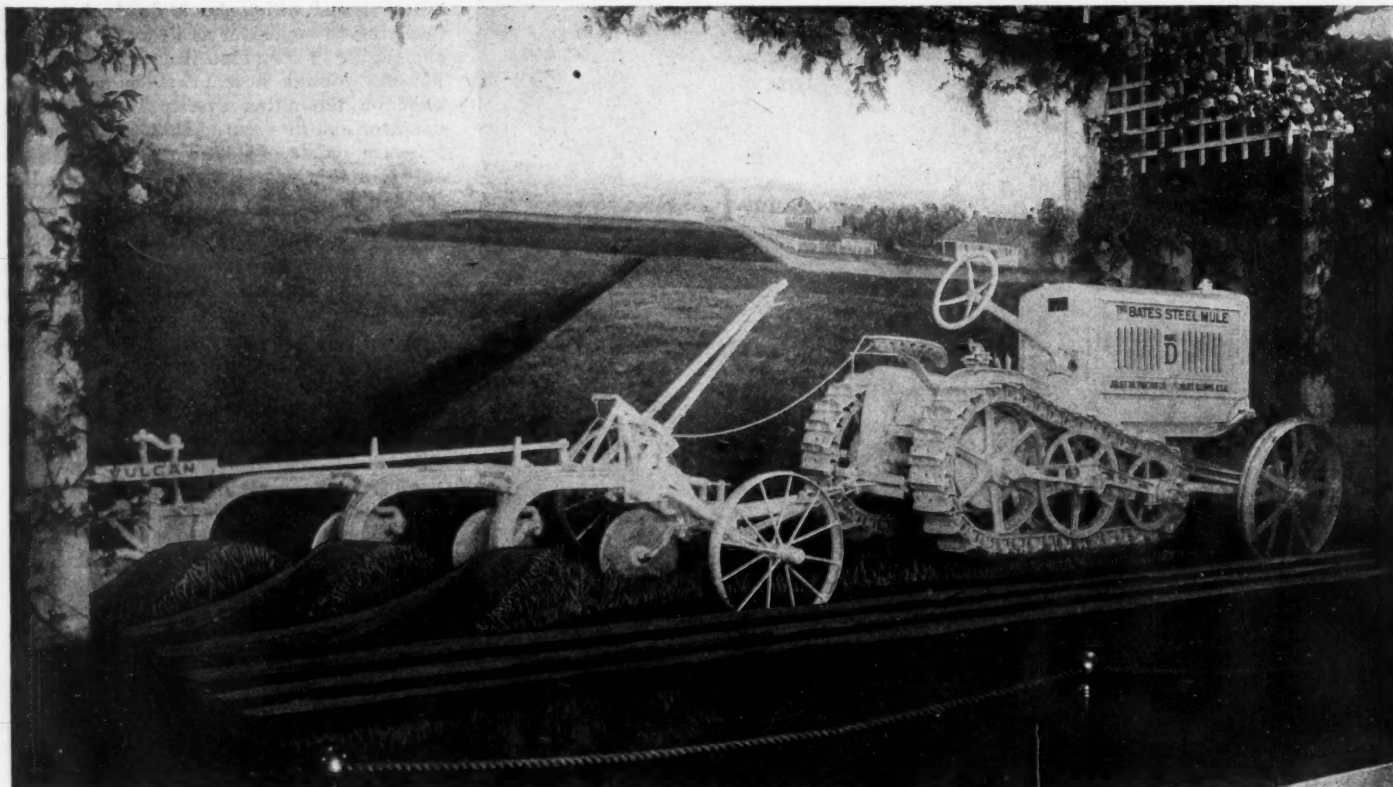
Perhaps the feature which is the greatest



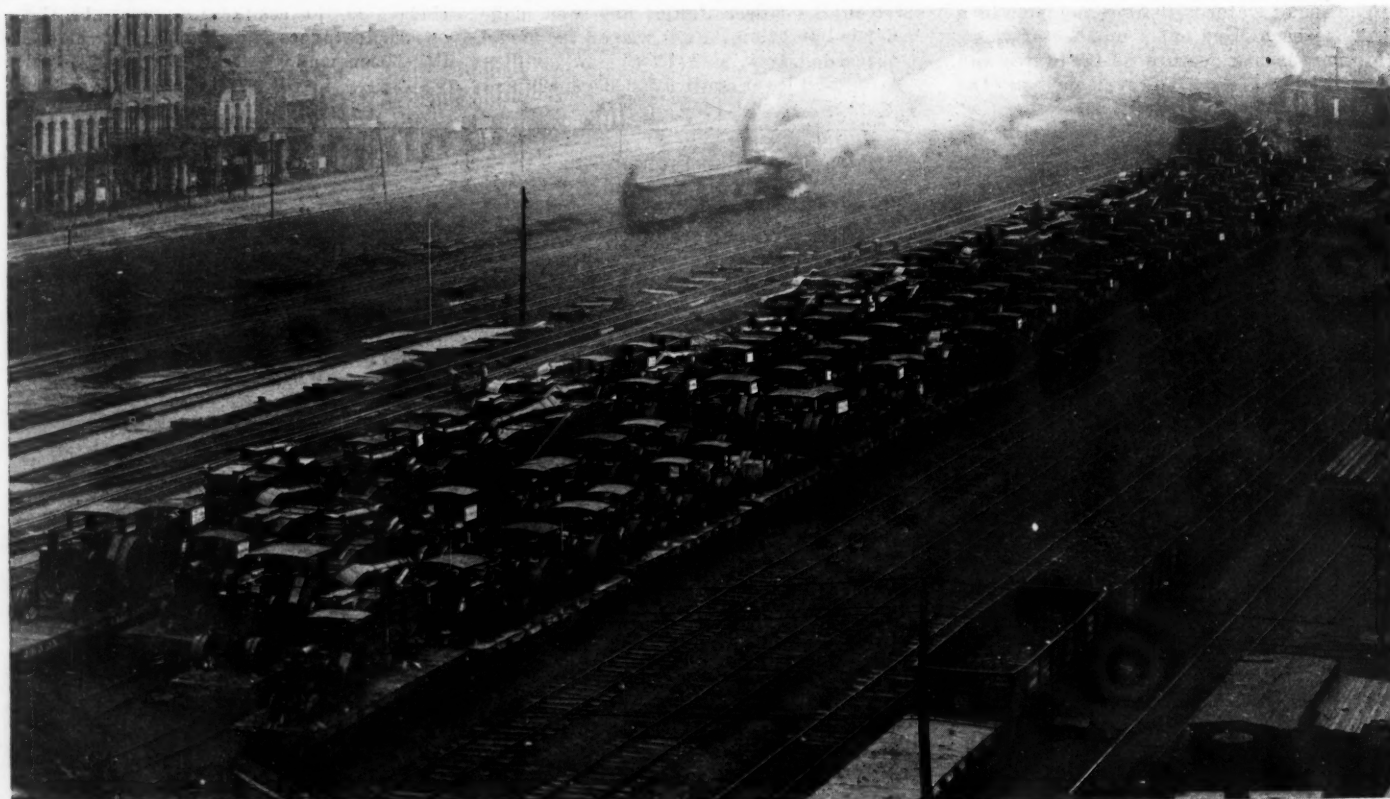
starting with the smallest model and ending with the of the whole exhibition, which was a wonderful affair

Two High Lights at Kansas City

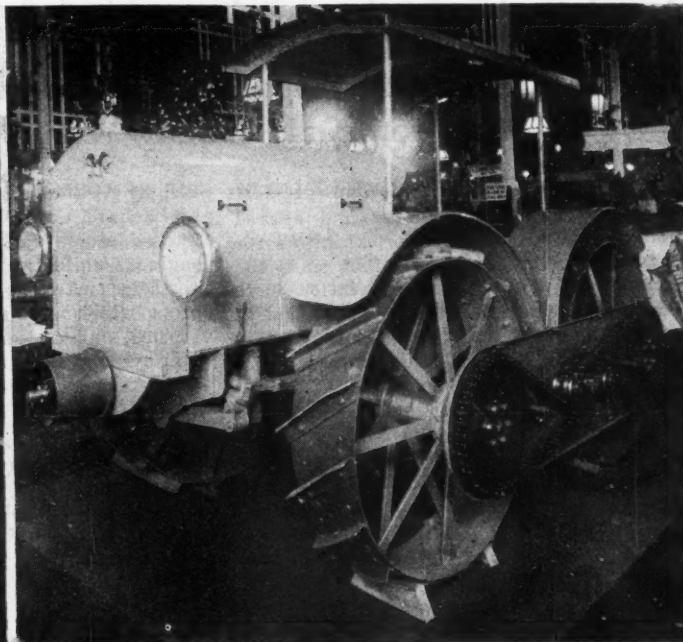
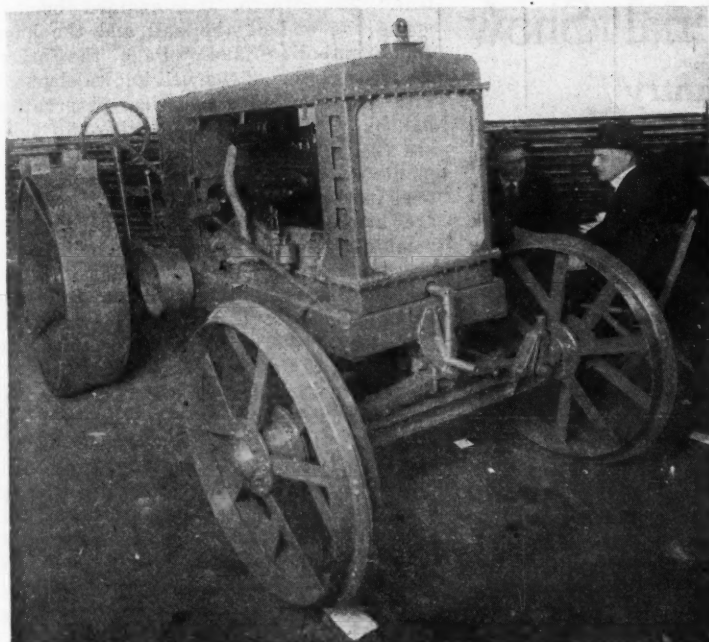
Huge Shipment of Tractors



This exhibit attracted the attention of all at Kansas City during the big tractor exhibition with its white finish and realistic setting



The \$250,000 shipment of Avery tractors and separators for Kansas and Oklahoma parked at Kansas City during the National Tractor Show last week



Two of the new tractors at Kansas City—showing the Heinze drive, right, and the Champion

step in advance in the newer designs of tractors is the reduction of friction losses in tractors and tractor-operated implements by improvement in bearings. There are two methods of improving the effectiveness of any machine. One of these is by increasing its power, and the other by decreasing the losses in the application of the power. From the standpoint of economy as well as for a number of other reasons, the elimination of power losses, particularly through friction of the parts, is preferable to an indiscriminate increase in power production.

It is for this reason that very great improvement of bearings in tractors and tractor-operated tools is to be considered a very distinct advance. The replacement of the plain bearing—with its high friction loss and its consequent tendency to wear—by anti-friction bearings of the ball or rolling type is quite general in the new tractor designs.

S. K. F. ball bearings have been installed this year on the clutch, pulley, fan shaft and differential of the Hart-Parr. U. S. and Fafner bearings also are employed on this tractor. The rear drive and bull pinion of the Dart also have S. K. F. The Nilson has Hyatt bearings on the front wheels, rear wheels and the transmission. The new Twin City uses Hyatt rollers and Bantam and New Departure balls. The Parrett has Timkens on all wheels. The Fordson uses Gurney bearings and is ball bearing equipped throughout.

The Hyatt roller bearings substituted for plain bearings in the artillery tractors developed and built by Holt for the Ordnance Department have been carried through into the commercial production of the Holt Caterpillar. With the change from one to two front wheels the La Crosse substituted Hyatt rollers for plain bearings in the forward running gear. U. S. bearings are also employed on the Holt agricultural tractors and this year also are part of the equipment of the Cleveland, Heider, Case, Emerson-Brantingham, Wallis, Moline, Bates and Best.

Of as great value as the lessening the friction in the tractor itself is the accomplishment of a similar result in the implements which the tractors are to operate. The new Moline binder designed specifically for tractor operation has thirty-five Hyatt roller bearings, and indication of what this means may be obtained from the fact that the new binder does twice as much work with the same power as the old plain-bearing binder. The new one makes a 10-ft. cut and travels faster than the old one, which cuts a swath only 6 ft. wide.

Another special tractor implement is the new Avery threshing machine. Hyatt rollers are fitted in the cylinder and blower—the points of severest service. New designs of farm machinery intended specially for tractor operation are now in development, and in most of these the substitution of ball or roller bearings for plain bearings is a feature.

TWO WISCONSIN SHOWS

Milwaukee, Wis., March 1—Two local motor shows of more than ordinary note were held in two of the larger communities of Wisconsin during the last week, each receiving the support of Milwaukee distributors affiliated with the Milwaukee Dealers, Inc., which, Jan. 24-30, conducted its twelfth annual Milwaukee show with greater success than any previous exposition of this character.

The eighth annual Racine show was held Feb. 20-22 in Lakeside Auditorium under the auspices of the Racine Automobile Trade Association. The total attendance exceeded 5000 despite inclement weather. Good results were obtained in the matter of actual retail sales and garnering prospects for spring business, both in passenger and commercial cars and tractors. Forty-seven distinct factories were represented.

The seventh annual state capital show was held in Madison, Wis., Feb. 26-March 1 in the Union Transfer building, with the Madison Overland Co. building as an annex. The show was conducted under the auspices of the Automobile Dealers' Division

of the Madison Association of Commerce and managed by Don E. Mowry, general secretary of the association. Next to the Milwaukee show, the Madison exposition is probably the most important annual event in Wisconsin trade circles, as it attracts from the entire southwestern Wisconsin territory and reaches even into northern Illinois. It is primarily a retail merchandising proposition, although the formation of dealer and sub-dealer connections by Madison tradesmen is an important feature.

The Madison show was automotive in that it presented passenger cars, trucks and tractors, with a special display of four Army aircraft engines brought by permission of the Government from Chanute field, Rantoul, Ill., in care of an expert mechanic.

Milwaukee distributors who made direct exhibits at Madison included the John G. Wollaeger Co., Studebaker and Peerless; Eckstein-Miller Auto Co., Marmon, Osmond Motor Car Co., Paige and Winton, Bachman Motor Co., Dort and Grant, International Harvester Co., Oliver Chilled Plow Works and J. J. Grant & Son, Maxotires.

USED CAR SHOW

St. Louis, Mo., March 3—St. Louis will have a used car show March 10-15 in the Exhibit building. Most of the decorations and fittings for the motor show will be used. The committee in charge is Edward Weber, R. C. Frampton and H. C. Henry. Robert E. Lee is manager.

All cars will be examined by a technical committee and will be given this recommendation: "This car has been inspected and approved as up to the standard of the Technical Committee for the used car sales show."

Cars sold during the day may be removed after the doors are closed and others put in their places. Inquiry indicates an unusual feature, that the companies which had the most machines for the previous used car shows are low on cars this year, while those not greatly interested before are well stocked.

Eighty-Five Exhibitors at Aerial Show

Planes for Sportsmen of Country Are Prominent Among War Models

NEW YORK, March 1—The greatest show aviation has ever had opened here to-day with eighty-five exhibitors for a two-week run. It is the first since the commercial possibilities of aviation have become so evident. It is under the auspices of the Manufacturers' Aircraft Association and occupies Madison Square Garden and the 69th Regiment armory.

Several so-called sport models, designed for merchandising among the numerous sportsmen of the country, are exhibited. The average selling price of these is around \$12,000 or \$15,000. Some of the planes embody features more akin to commercial aviation than to war. Windowed cowls protecting the occupants, superior body finish, luxurious upholstery and beauty of body lines and color borrowed from the best motor car body practice are evident.

Among the new models for sportsmen are the S-6 and S-7 brought out by the Thomas-Morse Aircraft Corp.; the Honeymoon Express and Messenger made by the Dayton-

Wright Airplane Co., and others exhibited by Packard, Curtiss and L. W. F. Both the Thomas-Morse models use 80-hp. LeRhône engines, while Dayton-Wright uses a 400-hp. Liberty twelve in the Honeymoon Express, which is to sell for from \$15,000 to \$20,000, and a de Palma 37-hp. air-cooled four-cylinder engine in the Messenger, which has a side-by-side seating arrangement.

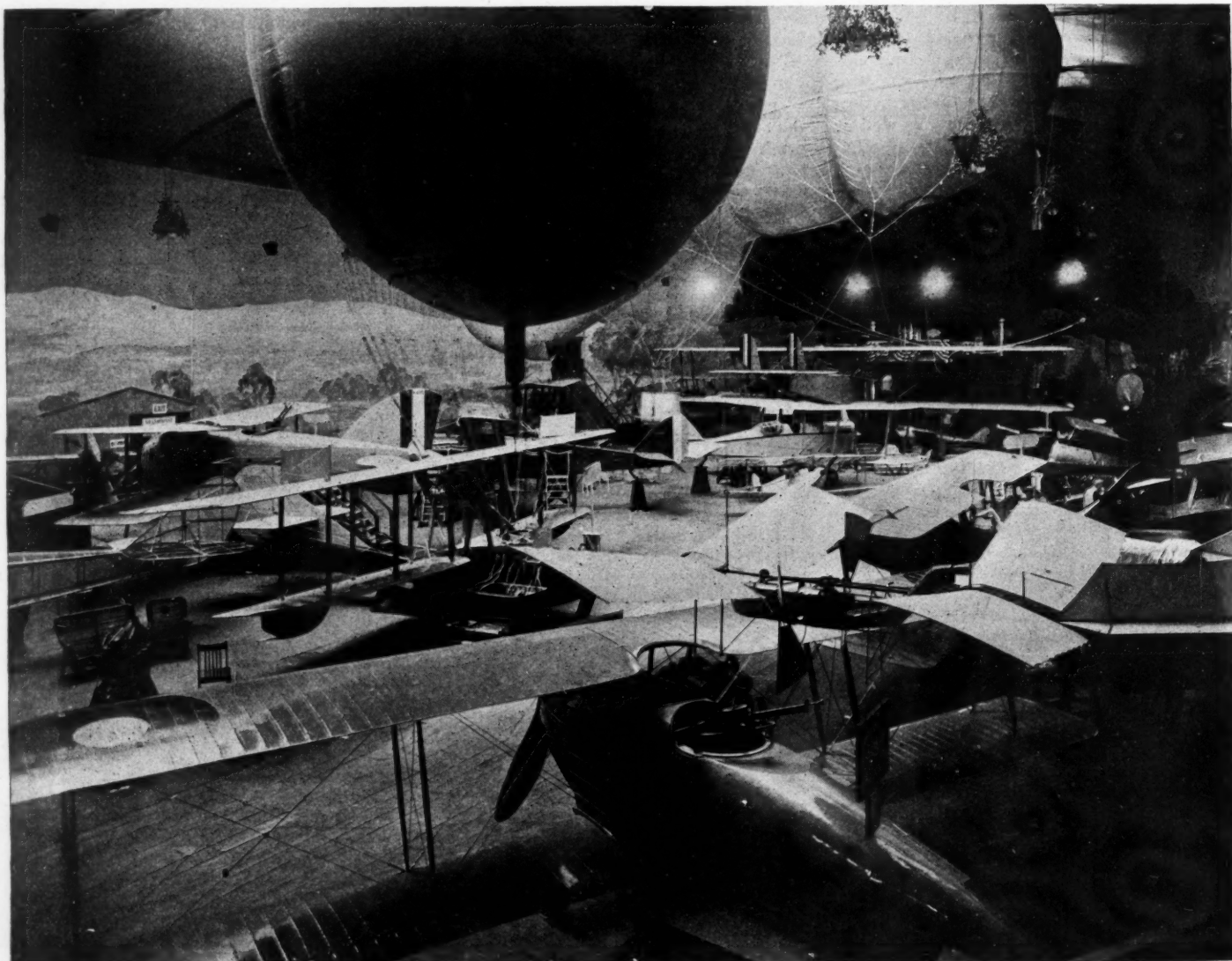
A three-passenger seaplane is exhibited by the Aeromarine Plane & Motor Co.; Wright-Martin is showing the Loening two-seated monoplane equipped with a 300-hp. Hispano-Suiza engine. The Gallaudet Aircraft Corp. also is showing a small monoplane. A giant Handley-Page with a wing spread of 100 ft. and nearly 61 ft. long is in the Garden with a Spad, Brequet, Caproni and SE-5 nearby. American planes include the L. W. F. which flew recently from Rantoul, Ill., to San Antonio, Tex., and a Dayton-Wright De Havilland 4.

The arrangement of the exhibits is excel-

lent. The Martin twin-engined bomber spans one end of the hall and the huge American-built Handley-Page the other. Above soars one of the well known elephant kite balloons and a spherical observation balloon. The center space and two sides are filled with smaller craft. In all, twenty planes are on view in the Garden and fourteen in the Armory. The Armory exhibits are arranged similarly, a huge Caproni bombing triplane occupying one end, a partly stripped F-5-L Navy flying boat the other end, most of the available sky space being filled by a veteran dirigible of seventeen months' service built by Goodrich. This latter is the Navy Coast Patrol A-247, the first accepted by the Government for patrol service. It is 167 ft. long by 33 ft. diameter with a volume of 80,000 cu. ft. and has a record of 23,000 miles covered.

The semi-official character of the show has brought about the co-operation of the War, Naval, Postoffice and Interior departments, and the program designates March 3 as Army day, when Secretary of War Baker will deliver an address. It is expected that Secretary Burleson of the Postoffice Department, Secretary Daniels of the Navy Department and Secretary Lane of the Interior Department also will be present.

The largest airplane on display is the



Madison Square Garden as the scene of an aviation show, the biggest ever held

F-5-L U. S. Navy flying boat, capable of carrying fifty persons. The letter F stands for Felixstowe, the British Naval Construction Station. The figure 5 designates the series number and the letter L indicates that the plane is equipped with the Liberty engine. This ship is an adaptation from a British flying boat. During the war it is used as a submarine chaser, has an upper wing span of 103 ft. 9 in. and a lower wing span of 74 ft. 4 in. Its length over all is 49 ft. 4 in. It stands 8 ft. 9 in. from the ground to the top wing. The chord is 8 ft. and the gap 8 ft. 10 in. Although its gross weight is 13,000 lb. it has a maximum speed of 87 m.p.h. and can climb to 2625 ft. in 10 min. It is equipped with two Liberty engines.

DENVER APRIL SHOW

Denver, Col., Feb. 28—Denver's show has been set for April 1-5. Cars, trucks, tractors and accessories will be shown. The show committee of the Denver Automobile Trades Association reports that a straw vote has resulted in a list of 164 dealers planning to exhibit an average of three machines each, while ninety accessory exhibits are promised thus far.

The show will be held in the stadium and two adjoining buildings at the Denver union stockyards and will have 51,000 sq. ft. of floor space. This is practically three times the amount of space in the Denver auditorium, where the association's 1917 show and several previous events of the kind were held.

The passenger cars will be in the stadium, the trucks will occupy more than 10,000 sq. ft. in another building, while the third structure will house the tractor and implement exhibit. The entire show will be under cover, with the three buildings connected to avoid need of going outside of shelter to get from one section of the exhibit to another. The accessories will be distributed to the best possible advantage.

Secretary and Business Manager Harrison Goldsmith of the trades body has been chosen general manager of the show, with Thomas M. Ray of the Miller-Ray Motor Co., Kissel distributor, chairman of the show committee, which consists of the association's directors.

SALEM HOLDS FIRST SHOW

Salem, Ore., Feb. 28—Under the management of Lee L. Gilbert and with the co-operation of local dealers Salem's first show was a distinct success from the standpoint of attendance, cars and general arrangement. Among the exhibitors were the Salem Auto Co., exhibiting Chevrolet and Scripps-Booth; Vick Bros., Ford; Valley Motor Co., Essex, Haynes and Hudson; H. F. Bonesteale, Paige, Moline tractor and Dodge Brothers.

1919 TRACTOR DEMONSTRATION

Kansas City, Mo., Feb. 28—The demonstration committee of the National Implement & Vehicle Association has decided on Wichita for the 1919 National Tractor Demonstration, to take place some time in July. The definite date has not yet been fixed. Exhibitions for Walla Walla, and Macon also have been given official sanction.

Motor Vehicle Taxes Now Part of Law

Revenue Bill Calls for 3% Levy on Trucks and 5% on Passenger Cars

CHICAGO, March 1—The Revenue Bill, having been signed by the President this week, now becomes a law and the motor vehicle provisions as reported in MOTOR AGE previously become effective. They are, in brief:

Three per cent tax on motor trucks and trailers.

Five per cent tax on passenger cars.

Five per cent tax on tires, parts, accessories and inner tubes.

Ten per cent tax on shows.

Ten dollars annual tax on taxicabs seating seven or less.

Twenty dollars annual tax on taxicabs carrying more than seven persons.

Three per cent of transport cost for freight by truck in competition with rail or water.

Three per cent of transport cost for freight by truck in competition with rail or water.

Five per cent of transport cost for express by truck or passenger car in competition with rail or water.

Eight per cent of transport fee for carrying passengers by truck, passenger car or motorcycle in competition with rail or water.

There is no floor tax or tax on motor fuels, nor is there any direct tax on car users except, that persons carrying on the business of operating or renting passenger cars for hire are taxed \$10 annually for each car seating more than one or less than eight persons and \$20 a year for cars seating more than seven.

The tax situation regarding the export of cars, tires, parts and accessories therefor is changed, so that under the new law all such articles "sold or leased for export and in due course exported," are not subject to the tax. This is in compliance with the Federal constitutional provision against taxes on exports.

There are some complicated provisions to the effect that on contracts for the sale or lease of cars and parts, etc., made prior to the date when this new law was first discussed in Congress, the purchaser or lessee must reimburse the seller or lessor for the tax that the latter has to pay.

Those liable for the tax on cars, tires, parts and accessories must make monthly returns under oath in duplicate to the local collector of internal revenue and pay the taxes due to this collector without further notice. If the tax is not paid when due a penalty of 5 per cent together with interest at 1 per cent per month is added. In case of over-payment of taxes the revenue bureau may return the over-payment.

The tax on cars, tires, parts and accessories becomes due when the article is sold or leased. This means, in the case of sales, when the legal title passes from the buyer to the seller or when the article ceases to be the property of the seller and becomes the property of the buyer, and in case of a lease the lease is effective generally when

the lessee receives possession of the article. Therefore, all sales and leases by car manufacturers and accessory manufacturers made on and after Feb. 25 are subject to the tax rates of the new law. All sales and leases made prior to Feb. 25 are either tax free or subject to the old tax rate, as the case may be.

BUFFALO SHOW ON BIG

Buffalo, N. Y., March 3—Special telegram—Buffalo's seventeenth annual show, known this year as the million dollar exposition, opened to-night with record-breaking entries and attendance. More than 250 cars and trucks are on display in the Broadway auditorium, including forty-five makes of passenger cars, nineteen of trucks, twenty-five displays of accessory manufacturers and tractors and tires. The total value of all exhibits at the show is estimated in excess of \$1,000,000.

The Broadway auditorium has 22,000 sq. ft. of floor space on one floor, under one roof, without obstructions, offering unusual possibilities for a great show. Japanese color and decorative scheme are followed throughout, giving a beautiful effect with oriental lighting throughout the hall. Every type of gasoline, electric and steam car is on display, with the greatest exhibit of accessories in the history of Buffalo.

Interest throughout western New York, lower Ontario and eastern Pennsylvania apparently is greater than ever before. Charles B. Kane, president of the Buffalo Automobile Dealers' Association, under whose auspices the show is given, to-night predicted a record-breaking attendance and sales. D. A. Lewis, secretary of the Buffalo Automobile Club, is show manager.

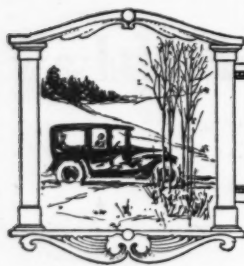
Every prominent truck manufacturer is represented at the exposition. Buffalo dealers plan many dinners and other events in honor of visitors. Band concerts and other features are on the daily program.

WESTERN DEALERS TO MEET

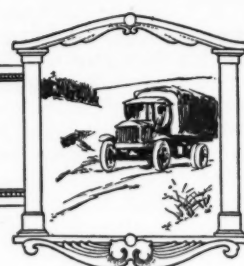
Denver, Col., Feb. 28—After several postponements because of the influenza epidemic, the annual convention of the Rocky Mountain Automobiles Trades Association is scheduled for March 3-4 at Pueblo. Hundreds of dealers are expected from throughout Colorado, New Mexico, Utah, Wyoming, Idaho, western Nebraska, western Kansas, western Oklahoma and northern Texas, and a lively welcome is being planned by the Pueblo tradesmen.

DETROIT SHOW OPENS

Detroit, March 3—Detroit's eighteenth annual show is in full swing this week. It opened Saturday night in the Crosstown garage and thousands are paying homage to the 1919 creations. More cars are on the floor than ever before, and in every other respect this year's effort far surpasses its predecessors. Forty-five passenger cars, thirty-three trucks, three tractors and accessories by the dozen are represented.



EDITORIAL



Meaningless Tractor Tests

LAST year the country literally was swamped with reports of fuel economy in tractor tests in all parts of the country. Often a dozen counties in the same state held a 1-hr. or a 1-acre fuel test and published broadcast the results of the test, giving the impression that the tractors would plow an acre on so much gasoline or kerosene. So general was this information and so hopelessly bewildering that it resulted in nothing short of chaos in the minds of those who tried honestly to decipher the results and to reach some accurate conclusions. The results were highly misleading and engendered deception and tended toward erroneous conclusions.

TAKE an example. The Wallis Tractor Co. gives us the information that in four different tests a certain tractor, not the Wallis, had the following fuel records per acre plowed:

Example No. 1—1.6 gal. per acre

Example No. 2—2.9 gal. per acre

Example No. 3—3.03 gal. per acre

Example No. 4—3.2 gal. per acre

Commenting on this, the Wallis company says:

The strange part of it is that there is nothing in the reports of these tests to indicate the changed conditions under which the tractor was working. One might pick up a magazine one day and read of the first performance, another day pick up another magazine and read of the fourth performance, and his only impression would be that somebody is juggling the figures.

WE agree in this. Last summer many tables of fuel performances on acre tests reached this office but were not used. They told nothing. There was nothing to show the kind of soil, the depth plowed, the speed of plowing, the rolling character of the soil, the relative state of moisture, the weather conditions

or any of the other factors that influence fuel performance in tractors.

THERE is still another aspect overlooked in many of these small tractor tests, the acre kind. The different tractor engines are allowed to warm the engines, sometimes for more than half an hour. They are getting ready for the job. Some have been known not to have reckoned in the gasoline used in starting and in warming up the engine. If the kerosene job has to take a long time to get well warmed up and some gasoline types have not, then these acre tests should take some recognition of such, because the farmer has to pay for the fuel that is used in warming the engine and getting ready to plow.

THE acre-demonstration test in nine cases out of ten is misleading. There should not be any test under 3 or 4 hr. of continuous plowing. When fuel is measured over such a period you get a fairly reliable record of what the tractor will do. Such a test does not cost the dealer much more than an acre test, and it does him much more good.

REPORTS of such tests should be such that a performance made in Ohio on rolling soil can be compared with one in Iowa or Illinois. If standardized reports were had from all forty-eight states, what a valuable collection of information the tractor makers and dealers as well as farmers would possess.

NOT only should the reports from such tests be standardized but the rules regulating them should be standardized, and there should be some authorized parties whose business it is to see that the tests are uniformly carried out and the rules uniformly administered.

Cleanliness in Repair Shops

THERE is one thing that can always be associated with the motor car service station giving good service to its customers, and that is cleanliness. A careful survey of any good service stations will bear this out. Cleanliness does not only mean that the place is clean from top to bottom but that the cars are neatly stored and no tools or equipment lying about to interfere with keeping the floor clean.

ONE service station recently visited requires its men in the repairshop to change their uniforms twice a week, on Monday and Thursday. These suits are of a white material and go a long way toward making the place inviting to the car owners. Men clad in clean uniforms also keep their tools and equipment clean as a rule, and therefore a highly polished car or beautiful upholstery is not so frequently besmeared with grease or oil from greasy tools carelessly handled.

ANOTHER garage repairshop paints the posts of its establishment every Saturday night, which gives them a chance to dry over Sunday and present a neat appearance on Monday

morning. In fact, the slogan of this concern to its men is, "Keep clean and your work will naturally follow the same channels."

CONTRAST the two service stations. At one the mechanics are at work in overall garments. These garments may not be white. Say they are khaki colored. At the other it is impossible to tell what color their clothing is for the layer of dirt and oil. Which service station would you rather have work for you? Which service station would you rather be the owner of? The answer is obvious. Also with the increasing recognition of the influence of the feminine element of the family on the purchase of a car, the dealer must pay more attention to the arrangement and conduct of his establishment in order that the feminine element may be attracted. Likewise, with the feminine element becoming so strong a factor in the motoring world, the service station or repairshop must see to it that his establishment attracts. Cleanliness is attractive in itself.

LEAVING all attractiveness aside, however, dealers and garagemen who have brought order out of chaos and in that order made cleanliness are of one mind—cleanliness means service, and better service.

The Service Behind the Tractor

By David Beecroft

SOME years ago it was a somewhat exclusive policy in advertising with a group of motor car and truck makers to advertise the factory that made the car, and all that the factory stood for in the way of expertness in designing, efficiency in manufacture, ability to give parts at low price and with dispatch and an all-round knowledge of the art and science of designing and manufacture.

That attitude toward the car or truck constituted what should be one of the fundamentals of service, that service which, first, makes vehicles that are capable of running well and, second, a factory that is set upon keeping them running well. Such a factory attitude does not mean free service. A factory with the good judgment to recognize the value of a good factory to its product is far too wise to stumble on that wrecking rock of free service.

Passing along the thought of the "factory back of the car," there is good opportunity for the maintenance system behind the car, or the truck or the tractor.

Some distributors and dealers only are selling, and selling well, this organization thought. The first job of the salesman is to sell the organization. That thought takes precedence to the product. Sell the organization.

You must have an organization to sell. A good organization of this kind is a combination of the factory, the distributor, the dealer and the subdealer. Such an organization reaches right from the chief engineer, through the works manager, through the maintenance manager right down through every avenue of the merchandising and distribution organization. It is the organization that is not only responsible for the manufacture of the job but an organization that, knowing the merit of the job, has stamina enough to be prepared to stand back of it.

Keeping Tractor Going

It is the engendering of that consciousness in the mind of the buyer that there is an organization as well as a product that breeds confidence. It is the consciousness that there is an organization just as determined to keep the product operating as it was determined to design, manufacture and sell it that breaks down sales resistance and also adds a new interest to service.

The dealer must be a part in this organization. The factory cannot be the beginning and end of such an organization. It has its share. The dealer has his. The most efficient bargain between maker and dealer and the greatest co-operation between them is best for both. The dealer's contract that is based on too low a discount destroys the organization that might be back of any tractor or truck. There must be a fundamental justice to maker and dealer to give fundamental justice to the consumer.

Take an application of this: The consensus at the Kansas City tractor show was that tractor sales have been moving slowly of late. Looking for the reason, you find many possible explanations. Some farmers are holding back until they feel they can buy a tractor that gives more performance for the price. Performance in nine cases out of ten means service. Service does not mean free service but rather intelligent repair of parts, done well and done in the quickest time possible.

Service has not been measuring up to this standard. There are some makers who for years have looked with almost grasping eye on the money they have made from the sale of spares. They have had the wrong vision on the whole subject. There is no more short-sighted man-

facturer than the one who aims to make profits out of spares sold at a high price.

There is no worse money that goes into the coffers of a factory than that coming from exorbitant prices on spares.

There is no better money going into a factory than that which comes from the sale of spares sold at the closest possible margin.

The old conviction of the manufacturer making huge profits out of spares is still strong in the mind of the farmer. It is bad enough for him to have a part that breaks but it is the last straw, so to speak, when he realizes the price for the part is exorbitant.

Holding Up Sales

Such a policy is poor advertising. It is not the open sesame to repeat order business. It is such a policy that results in tractor sales being held up in certain counties, where farming conditions are such that sales should go ahead rapidly.

From several dealers come the reports of tractors not making good as they should. The trouble seems partly on both sides of the fence. Each side wants to place the blame on the other. The fault lies somewhere, and until it is correctly placed and a remedy applied there will be at least three parties who are not satisfied—the maker, the merchandiser and the consumer.

The solution can be started in the organization.

One work of such an organization is to grasp the educational work needed on the farm with reference to the tractor. The message of the tractor in all its aspects must be carried to the farmer. He must read tractor, think tractor and dream tractor.

If the catalogs are not well written, they must be revised. There is not one that measures up to the needs of the hour. There should be two kinds of catalogs, one a selling catalog and the other a maintenance catalog. Once you sell a machine get the maintenance catalog into the farmer's hand.

The maintenance catalog is not an instruction book. It is just what it means—a maintenance catalog. It has not a word of misrepresentation in it. It is not written to puff up some factory, some engineer or some form of construction. It is written to explain that tractor from a to z to the farmer. It does not tell him how to repair it or adjust it. It merely explains it. It is an educational story of the tractor. The farmer gets it two or three weeks, perhaps longer, before he gets his tractor. It may be that a good organization has a whole series of these educational catalogs. One can tell an understandable story of lubrication. Another can deal with ignition only. The third can treat of carburetion. The fourth might deal with the humanities of the internal combustion engine. In the next would be a story on transmission of power. There might be more as the organization saw fit.

Known by Works

A comprehensive scheme of education such as this would be one indication of an organization that might stand back of a tractor and that would be worthy of the name of an organization.

A real organization always will be known by its works, rather than by its words.

Half Billion for Highways Is Assured

Postoffice Bill Carries \$209,000,000 to Add to Funds Already Available

WASHINGTON, March 1—With full state co-operation according to the terms of the Federal Aid Road Act, the United States will have a total of at least \$574,000,000 for co-operative road-building during the next three years. The Federal part of this fund is assured by an extra appropriation of \$209,000,000 in the Post-office appropriation bill just passed by Congress and signed by the President. This amount is the largest ever appropriated for similar purposes and for a similar period by any government and it enables the Federal and state governments to carry out a road-building program of a magnitude never equaled.

In connection with the program it also is noted that expenditures for highway work in the United States this year are likely to amount to \$500,000,000 or more. On reports received from state highway departments, the Bureau of Public Roads estimates the 1919 expenditures for roads and bridges at \$385,000,000, or \$110,000,000 more than the average expenditures for 1916 and 1917.

An important effect of the law containing the new appropriation is that it

broadens the definition of a rural post road, under which class a highway had to qualify to receive the benefits of the Federal Aid act. Under the old act it was required that mail should actually be carried on the road or that there should be a reasonable prospect that mail would be carried on it within a short time after improvement. The new act says " * * * the term 'rural post roads' * * * shall be construed to mean any public road, a major portion of which is now used or can be used, or forms a connecting link not to exceed 10 miles in length of any road or roads now or hereafter used, for the transportation of the United States mails, excluding every street and road in a place having a population, as shown by the latest available Federal census, of 2500 or more, except that portion of any such street or road along which the houses average more than 200 ft. apart."

The new act also raises the Government limit of contribution from not to exceed \$10,000 a mile to not to exceed \$20,000 a mile, taking account of higher present costs of labor and materials.

The law also authorizes the Secretary of War to transfer to the Secretary of Agri-

culture material, equipment and supplies suitable for highway improvement and not needed by the War Department.

The original Federal Aid Road Act, which became a law in July, 1916, appropriated \$75,000,000 to aid in the construction of post roads during a five-year period ending June 30, 1921, and \$10,000,000 to aid in forest-road building during a ten-year period ending June 30, 1926. Not over \$3,000,000 of the original \$85,000,000 had been expended prior to 1919, so \$82,000,000 plus \$209,000,000, or a total of \$291,000,000 of Federal funds, will be available, of which \$287,000,000 will be available during the next three years. The act and its amendment require the states to provide at least an equal amount on the post-road work, and it is customary for the states and localities to contribute toward the forest-road work.

FORDSON DISTRIBUTERS DINE

Kansas City, Mo., March 1—The first annual dinner of the Fordson Distributors' Association and the Southwestern Fordson dealers attending the tractor show was given at the Hotel Muehlebach Thursday evening. Nearly every distributor in the United States and Mexico, as well as several hundred Fordson dealers, attended.

The dinner was given under the direction of the G. F. O'Malley Motor Co. A frontier town of early Southwest was reproduced while the walls were covered with

Approximate Apportionment of Funds Under Federal Aid Road Act and Amendment

States—	Amount available for fiscal years 1917, 1918, 1919	\$50,000,000 for fiscal year 1919	Fiscal year 1920 allotment	Fiscal year 1920	Fiscal year 1921 allotment	Fiscal year 1921	Total
Alabama	\$ 625,903.17	\$ 1,050,264.10	\$ 420,105.64	\$ 1,575,396.15	\$ 525,132.05	\$ 1,575,396.15	\$ 5,772,197.26
Arizona	411,081.14	685,043.57	274,017.43	1,027,565.36	342,521.79	1,027,565.36	3,767,794.65
Arkansas	498,085.77	840,229.53	336,091.81	1,260,344.30	420,114.76	1,260,344.30	4,615,210.47
California	909,358.99	1,524,248.30	609,699.32	2,286,372.45	762,124.15	2,286,372.45	8,378,175.66
Colorado	867,570.90	867,570.90	347,028.36	1,301,356.35	433,785.45	1,301,356.35	4,759,446.75
Connecticut	185,487.77	307,064.65	122,825.86	460,596.98	153,532.32	460,596.98	1,690,104.56
Delaware	48,965.10	81,384.45	32,553.78	122,076.68	40,692.22	122,076.68	447,748.91
Florida	338,652.69	573,797.20	229,518.88	860,695.80	286,898.60	860,695.80	3,150,258.97
Georgia	806,897.89	1,346,044.75	538,417.90	2,019,067.12	673,022.38	2,019,067.12	7,402,517.16
Idaho	363,862.05	610,509.27	244,203.71	915,763.91	305,254.64	915,763.91	3,355,357.49
Illinois	1,321,102.17	2,185,550.65	874,220.26	3,278,325.97	1,092,775.32	3,278,325.97	12,030,300.34
Indiana	813,473.04	1,349,919.40	539,967.76	2,024,879.10	674,959.70	2,024,879.10	7,428,078.10
Iowa	873,180.41	1,443,046.20	577,218.48	2,164,569.30	721,523.10	2,164,569.30	7,944,106.79
Kansas	858,754.08	1,436,313.93	574,525.57	2,154,470.89	718,156.96	2,154,470.89	7,896,692.32
Kentucky	585,400.35	976,865.17	390,746.07	1,465,297.76	488,432.59	1,465,297.76	5,372,039.70
Louisiana	406,179.27	680,729.03	272,291.61	1,021,093.55	340,364.51	1,021,093.55	3,741,751.52
Maine	290,161.92	481,231.35	192,492.62	721,847.33	240,615.78	721,847.33	2,648,196.53
Maryland	263,013.09	434,737.02	173,894.81	652,105.53	217,368.51	652,105.53	2,393,224.49
Massachusetts	442,814.70	736,883.30	294,753.32	1,105,324.95	368,441.65	1,105,324.95	4,053,542.87
Michigan	872,707.53	1,447,213.80	578,885.52	2,170,820.70	723,606.90	2,170,820.70	7,964,055.15
Minnesota	853,047.58	1,420,774.53	568,309.81	2,131,161.80	710,387.26	2,131,161.80	7,814,642.78
Mississippi	535,469.12	899,488.26	359,795.31	1,349,232.39	449,744.14	1,349,232.39	4,942,961.61
Missouri	1,017,765.21	1,695,314.11	678,125.64	2,542,971.14	847,657.05	2,542,971.14	9,324,804.29
Montana	593,382.46	999,467.15	399,786.86	1,499,200.73	499,733.58	1,499,200.73	5,490,771.51
Nebraska	639,757.68	1,066,642.07	426,656.83	1,599,963.10	533,321.04	1,599,963.10	5,866,303.82
Nevada	386,424.72	642,933.45	257,173.38	964,400.18	321,466.72	964,400.18	3,536,798.63
New Hampshire	125,599.97	207,810.38	83,124.15	311,715.57	103,905.19	311,715.57	1,143,870.83
New Jersey	353,995.26	594,050.80	237,620.32	891,076.20	297,025.40	891,076.20	3,265,844.18
New Mexico	474,847.98	798,785.78	319,514.31	1,198,178.67	399,392.89	1,198,178.67	4,388,898.30
New York	1,501,835.01	2,487,956.40	995,182.56	3,731,934.60	1,243,978.20	3,731,934.60	13,692,821.37
North Carolina	685,702.23	1,139,977.47	455,990.99	1,709,966.20	569,988.74	1,709,966.20	6,271,591.83
North Dakota	458,015.09	768,360.27	307,344.11	1,152,540.42	384,180.14	1,152,540.42	4,222,980.46
Ohio	1,118,759.68	1,854,462.47	741,774.29	2,781,693.71	927,231.24	2,781,693.71	10,205,625.80
Oklahoma	691,906.34	1,153,055.50	461,222.90	1,729,583.25	576,527.75	1,729,583.25	6,341,878.29
Oregon	472,394.85	787,459.10	314,983.64	1,181,188.65	393,729.55	1,181,188.65	4,330,944.44
Pennsylvania	1,382,078.29	2,296,075.85	918,430.34	3,444,113.77	1,148,037.92	3,444,113.77	12,632,849.94
Rhode Island	69,969.51	116,530.95	46,612.38	174,796.43	58,265.48	174,796.43	640,971.18
South Carolina	430,437.00	717,297.05	286,918.82	1,075,945.58	358,648.52	1,075,945.58	3,945,192.55
South Dakota	486,013.67	810,720.68	324,288.27	1,216,081.02	405,360.34	1,216,081.02	4,458,545.00
Tennessee	683,123.95	1,132,103.50	452,841.40	1,698,155.25	566,051.75	1,698,155.25	6,230,431.10
Texas	1,752,770.13	2,926,219.37	1,170,487.75	4,389,329.05	1,463,109.69	4,389,329.05	16,091,245.04
Utah	341,613.62	567,592.10	227,036.84	851,388.15	283,796.05	851,388.15	3,122,814.91
Vermont	136,662.33	225,987.70	90,395.08	338,981.55	112,993.85	338,981.55	1,244,002.06
Virginia	597,102.90	992,052.95	396,821.18	1,488,079.43	496,026.48	1,488,079.43	5,458,162.37
Washington	432,183.03	722,367.25	288,946.90	1,083,550.87	361,183.62	1,083,550.87	3,971,782.54
West Virginia	319,525.27	532,009.10	212,803.64	798,013.65	266,004.55	798,013.65	2,926,369.86
Wisconsin	767,790.41	1,272,946.53	509,178.61	1,909,419.79	636,473.22	1,909,419.79	7,005,228.39
Wyoming	367,396.24	612,912.45	245,164.98	919,368.68	306,456.22	919,368.68	3,370,667.25
Total	\$29,100,000.00	\$48,500,000.00	\$19,400,000.00	\$72,750,000.00	\$24,250,000.00	\$72,750,000.00	\$266,750,000.00
Administration	900,000.00	1,500,000.00	600,000.00	2,250,000.00	750,000.00	2,250,000.00	8,250,000.00
Grand total	\$30,000,000.00	\$50,000,000.00	\$20,000,000.00	\$75,000,000.00	\$25,000,000.00	\$75,000,000.00	\$275,000,000.00

paintings depicting the development of agriculture from primitive times to the advent of the tractor.

C. L. Herring, Fordson distributor at Des Moines, Iowa, was toastmaster, and the speakers of the evening were David Beecroft, directing editor of the Class Journal Co., Rev. Burris A. Jenkins, Guy H. Hall, E. E. Peake and A. P. Osborn.

HUDSON PEACE SCHEDULE

Detroit, Feb. 28—The Hudson Motor Car Co. will devote the entire plant erected for the manufacture of shells during the war to the production of the Essex. It is estimated it will make 20,000 Essex cars this year. The same number of Hudson Super-Sixes will be turned out and it is estimated that the monthly output of Super-Sixes will be about 2000. At a recent meeting of the board of directors the expenditure of \$1,000,000 was authorized for additional machinery and manufacturing facilities.

GREAT YEAR AHEAD

Akron, Ohio, Feb. 28—The General Tire & Rubber Co., whose sales increase last year was 120 per cent over 1917, anticipates a business volume exceeding \$10,000,000 this year. This company is not quite four years old, but in that short period it has obtained national distribution. Last year this company turned its capital four and one-half times.

PEERLESS UP ON DELIVERIES

Cleveland, Ohio, Feb. 28—The Peerless Motor Car Co. made its initial shipment of post-war cars within thirty-three days after hostilities were halted. During the first three years of the war, the company devoted 75 per cent of its facilities to war work and during the fourth year this was increased to 100 per cent. As soon as the armistice was signed the company began shifting back to car production and is now in a position to fill its commercial orders promptly.

NO CHALKIS CAR YET

Detroit, Feb. 28—The Chalkis Mfg. Co., organized at the outbreak of the war for gun production and which was busy on several Government gun contracts when the armistice was signed, will devote its efforts to commercial automotive production, but the exact nature of its product has not been decided upon at this time. The company proposed to bring out a new car, but this project has been abandoned.

BULLOCK LEAVES FARM FIELD

Chicago, March 3—The Bullock Tractor Co. will confine itself henceforth to the industrial field. O. C. Parker, sales manager, recently returned from an extensive survey of the southwestern oil fields and finds so large a demand there for tractors of the Bullock type he is convinced the company will find an outlet for its full production in meeting this demand and in taking care of the demand in the road and general contracting fields. For this reason the company for the present will make no attempt to build a farm tractor.

Roads to Be Built for Motor Traffic

Builders Recognize Truck Must Be Standard of Highway Transport

NEW YORK, March 1—The general consensus at the sixteenth annual convention of the American Road Builders' Association, which met here this week, is that roads must be built with due regard to the strains and stresses imposed on them by heavy automotive traffic. It is being emphasized that the motor truck is the king of the road and that it is imperative that not only main highways but connecting roads shall be so constructed as to be fully capable of standing up under intensive motor traffic.

Highway engineers who may have hitherto considered road problems on a horse and wagon basis are now obviously fully alive to the fact that mechanical road transport has arrived, and whether they may be advocates of bitumenized or brick surfaces or cement or macadam foundations they have adapted themselves to the new order in no half-hearted way and, without exception, have declared themselves staunch supporters of whatever type of highway is most suitable for the truck.

Evidence of the realization of the coming of the motor truck as the standard method of highway transport was given over and over again. For example, Francis M. Hugo, secretary of state for New York, stated that it was with a full realization of the importance of the motor truck that appropriations covering road construction for the present and future years were made and that, moreover, 90 per cent of the increase in 1918 registrations for New York were accounted for by the increase in the number of commercial motor vehicles in service.

VELIES FOR 1919

Moline, Ill., Feb. 28—The Velie Motors Corp. is back from war to peace work and is turning out on an average of forty-five machines daily. The company expects to manufacture 15,000 cars this year.

NATIONAL SALES \$2,880,757

Indianapolis, Ind., Feb. 28—Net sales of the National Motor Car & Vehicle Corp. totaled \$2,880,757 last year. After deducting \$2,395,793 for cost of sales, gross profits of \$484,964 remained. Operating expenses and reserve equalled \$236,502, miscellaneous income \$18,325 and gross income \$266,787. Subtracting interest of \$63,178 and \$65,000 reserved for income and war taxes, the net income was \$138,609.

ORDERS FOR FOUR MONTHS

Flint, Mich., Feb. 28—Buick has orders for every machine it can produce up to July 1. The company is producing more than 400 cars daily and, notwithstanding the setback caused by war reconstruction, hopes to equal its 1917 production mark of 135,000 cars.

Within the last year Buick has passed through a period of great expansion. A huge warehouse and loading dock has been

completed. The big shed covers six tracks, each track having a capacity of twenty-two freight cars. This warehouse and loading dock can accommodate 1000 cars and by a double-decking arrangement an additional 1000 machines can be stored. A new bronze and aluminum foundry is just being finished and will be in operation soon.

GOODRICH SALES INCREASE

Akron, Ohio, Feb. 28—Net sales of the B. F. Goodrich Co. for 1918 amounted to \$123,470,188, an increase of \$36,315,116 over the \$87,155,072 sales in 1917. After deducting for bills payable, taxes, etc., a net profit of \$15,637,115 remained, \$5,092,437 more than for 1917. After dividends were taken off the surplus was \$10,442,609 as against \$5,257,491 in 1917.

ANDERSON INCREASES CAPITAL

Rock Hill, S. C., March 1—The Anderson Motor Co. has increased its capital to \$1,500,000 to take care of increase in production. The sales organization has been expanded also, and the company is erecting a new assembling plant which is to be completed May 1. This will make it possible for the company to more than double its present production.

PACKARD BACK ON CARS

Detroit, Feb. 28—Packard has completed its shift from 100 per cent war production back to commercial work and has resumed the manufacture of passenger cars, the first of which will be ready in May. Commercial truck manufacture has been under way for some time.

KELLY-SPRINGFIELD PROFITS

New York, Feb. 28—Gross profits of the Kelly-Springfield Tire Co. for the year ended Dec. 31 amounted to \$7,187,835 as against \$4,323,955 for 1917, and a surplus after dividends were paid of \$2,939,992, an increase of \$1,486,407 over 1917. The general surplus of \$9,197,858 is an increase of \$3,492,226 over \$5,705,632 in 1917.

2000 ROAMERS IN 1919

Kalamazoo, Mich., March 1—The 1919 schedule for the Barley Motor Car Co., maker of the Roamer passenger car, calls for 2000 machines. The company has been operating at normal capacity for thirty days and expects to increase its production 200 per cent within the next month.

METZ ROADSTER \$1,400

Waltham, Mass., Feb. 28—The six-cylinder car, which the Metz company is putting out, will make its appearance about March 15 in three models. The roadster will sell for \$1,400, the touring cars for \$1,600 and the closed car for \$2,100.

Fuel as a Tractor Problem

Whole Industry Must Aid in Solving That and Other Questions of Design

KANSAS CITY, Mo., Feb. 27—Tractor design, fuel and testing were the three important phases of the industry brought up in connection with the S. A. E. tractor meeting this afternoon in the auditorium of the Sweeney Automobile School. As the tractor now stands on the threshold of immense expansion into practically every part of the world where soil cultivation is carried on and as the tractor naturally will be a large consumer of motor fuel because of the fact that it practically runs under full load at all times, the matter of design becomes of the highest importance. The papers of the afternoon, therefore, approached these matters from several angles, all of which showed that in the next few years tractor engineers must co-operate with the oil refiner, if we are going to realize anything like efficiency.

Four Papers Read

Four papers were presented. "Tractor Testing" was the title of the paper by Prof. J. B. Davidson, University of California, who, however, was not able to be present. His paper was read by the secretary. Dr. J. E. Pogue, U. S. Fuel Administration, read a paper on the fuel situation which was in keeping with his address to the S. A. E. at its winter meeting in New York. Probably one of the most interesting papers was the one by E. R. Hunter, consulting engineer of the International Motor Co., on "The Principles of the Wheeled Farm Tractor."

In his address on "The Future Development of Tractor-Drawn Implements," Prof. E. A. White of the University of Illinois stated that inasmuch as agriculture was the sustaining power of mankind, development of machinery to properly carry on the work of pioneers like Deere, Avery, McCormick and others is of greatest importance. During the transition period, through which the whole machinery world is now going, it becomes necessary to give much thought to improvement in farm implements designed to be drawn by the tractor. Thus we must put roller and ball bearings on implements where plain bearings sufficed when these implements were horse-drawn. The tractor subjects the implement to severe strains, and in place of ordinary iron we must substitute heat-treated metals, etc. In short, the present types of agricultural implements are unsuited to the tractor and much development work is necessary. The speaker stated that he hoped to see research laboratories in every large implement manufacturer's plant for the proper carrying on of tests and experiments in order that the implement developments may run parallel with that of the tractor itself.

Owing to the length of some of the papers there was little time for discussion, most of this occurring after the presentation of Doctor Pogue's paper.

The trend of thought throughout the afternoon meeting showed clearly that to

solve the many future problems of the tractor business requires the active participation of the whole automotive industry. This is made so from the fact that for one thing fuel is much harder to standardize than automotive apparatus. Secondly, automotive apparatus is gaining in production more rapidly than the supply of motor fuel. This leads to the subject of higher thermal efficiency, for if, as shown by Doctor Pogue's paper, the curve of consumption has crossed the curve of production of crude petroleum, we are facing a critical situation in not only the tractor field but in every other industry where motor fuel is used. We are, so to speak, drawing on our reserve supply of crude, with an ever increasing use of automotive equipment.

The issue of the future seems to be that the design of engines forming the powerplants of our automotive apparatus will follow one of two lines. First, we might reasonably expect to see motor trucks and tractors burning a heavy fuel entirely impractical for passenger car use, and thus keep a higher grade of fuel for the latter's use. Secondly, there is a possibility that a fuel may be developed which all three can burn with maximum efficiency.

The afternoon's discussion brought up the matter of fuel substitutes. Benzol, it was shown, offered a possibility so far as being sold at a competitive price with gasoline, but its production is limited. Shale oil and alcohol cannot be made to sell along with gasoline at the present time, but Doctor Pogue pointed out that as soon as our present supply of crude petroleum has been exhausted shale oil will be mined and probably be able to take care of automotive needs for years to come.

TO DISCUSS AIRPLANES

New York, March 1—The commercial future of aviation will be considered at the meeting of the Society of Automotive Engineers to be held here March 7 in connection with the airplane show. C. H. Day, chief engineer of the Standard Aircraft Corp., will deliver a paper on this subject; Archibald Black, of the Navy, formerly chief engineer of the L. W. F. Engineering Co., will read a paper on airplane radiators, and Ladislas d'Orsay, on dirigibles.

The evening session following the dinner will include addresses by officers of the United States Army and Navy and members of the automotive industry, among them Brig.-Gen. William Mitchell, who has just returned from abroad, where he served two years in aerial operations; Commander J. C. Hunsaker, U. S. N., who has just completed an inspection trip through England, France, Italy and Germany; Col. Thurman H. Bane, chief of the engineering division of the Department of Military Aeronautics, and Lieut.-Col. Virginius E. Clark, chief of engineering at McCook field.

In his paper on tractor testing Mr. Davidson made a plea for some standardized forms of conducting tractor tests, so that means may be at hand to compare performances with some degree of accuracy. He also stated that more time should be given to the preparation of tractor tests, as the testing equipment or the tractor itself in many cases is not in the best condition to get figures of any value. Mention also was made that up to the present time no concern was furnishing any sort of testing apparatus which would give the drawbar pull total work and other features of a tractor operating over a long period. To this Professor White of the University of Illinois replied that a concern in Champaign, Ill., was offering a traction dynamometer wherein the factors of time, distance, drawbar and total work are taken in, with no limit to the time of operation.

Size of Future Tractor

Speaking of the size of tractors, Mr. Hewitt stated that he was obliged to differ with the general opinion that the small tractor is the future economical unit. Expense of operating, he stated, might be divided into three headings of operator's wages, fuel and oil and maintenance charges. The driver of the small machine receives as much as the driver of a large tractor. He went on to say the maintenance charges for actual repairs on the larger machine, if built correctly, is not greater than on the smaller one and that the only difference here will be in the interest and depreciation items. Oil and fuel cost will prove to be the greatest difference in expense. This, however, the author stated, is much lower per acre on the large unit than on the small; therefore, the operating expense per acre on the large machine will be less than on the small machine, primarily because the driver's wages will prove to be at least a third of the whole cost.

As to what the future holds in tractor design, Mr. Hewitt stated that we may expect to see gearboxes and clutches to render good service from five to ten years without repairs, if the loads are properly proportioned, as the tractor will not operate more than about 120 days out of the year. The chief places where wear will occur are in the engine and final drive. Engine wear is caused chiefly by dust, and the author stated that in his opinion the present air cleaners for tractors do not eliminate altogether the very fine dust particles, which make up the cutting element that ruins cylinder walls. With a regular overhaul every year or two, the author stated, tractor engines if protected from dirt should give ten years' service.

In regard to front or rear wheel drive, the author pointed out that with the rear wheel drive it can be proportioned so that nearly all of the weight of the front can be carried by the rear wheels when the full engine power is applied, leaving only enough weight in front for proper steering.

Several hundred engineers and guests attended the tractor dinner at the Hotel Baltimore in the evening. The speakers included Guy Hall, manager of the tractor show; Finley P. Mount, Advance-Rumely Co.; J. B. Bartholomew, Avery Co.; David Beecroft, directing editor of the Class Journal Co.; Dr. J. E. Pogue, and Edward A. Johnston.

Guy Hall extended a welcome to the engineers and tractor makers and hoped the show next year would be even larger and more successful than the present. Mr. Mount, toastmaster, referred to the show as the international tractor show of the world. J. B. Bartholomew stated in his talk that the ultimate dealer, whether he comes from the old line of implement dealers or motor car dealer, in less than five years would be carrying one of two lines: First, a line of tractors and tractor-drawn implements or, second, a line of implements leaning toward the present types of horse-drawn implements. Dr. Pogue gave practically the high spots of his talk during the afternoon technical session. A very interesting talk illustrated by slides was given by Mr. Beecroft on his recent European trip as guest of the British commission.

TO REPAIR BROOKLANDS

Weybridge, England, Feb. 8—By mail—The Brooklands track, which received considerable damage during the war as a result of the heavily laden motor trucks that crossed and recrossed the track at various places, is to undergo extensive repairs so

that racing may be resumed. The owners are awaiting the pleasure of the government in response to a claim for repairs, and until reply is obtained no reconstruction or repair work will start. The concrete surface of the track is broken up in many places, and at the fork where the finishing stretch branches from the main track, the surface is all full of holes. Where the surface was strong enough to resist the trucks' weight, the whole foundation sunk, so hollows and gulleys that would wreck a car exist.

UNIONTOWN RACE PRIZES

Uniontown, Pa., Feb. 28—The opening meet on the Uniontown speedway May 17 will pay \$10,000 in prize money. The mid-summer meet July 19 probably will pay a like amount, but the nature of the events has not yet been definitely decided. In all probability it will consist of heat races. The autumn event on Labor Day will pay \$15,000.

GUYOT WILL RACE

Chicago, Feb. 28—A cablegram has been received in this country to the effect that Albert Guyot will race at Indianapolis, May 31. Guyot drove one of the Sunbeams at its first appearance in this country, in 1913. The next year he won third place in a French Delage at Indianapolis. He was discharged from the French army last year as the result of injuries received while on active service as an airplane pilot and entered into partnership with M. Causan as a firm of consulting engineers. Both Guyot

and Causan, who produced successful boat and car engines for Delage and others, are particularly interested in racing and aviation development.

Jules Goux, also an entry for Indianapolis, will drive the same Peugeot that Georges Boillot drove in the last French Grand Prix in 1914. Goux was the first foreign driver to win the 500-mile, taking it in 1913.

C. Y. Kenworthy, Chicago distributor of the Roamer, has bought the racing car Eddie Hearne campaigned and will enter it at Indianapolis. The car formerly was known as the Duesenberg but has been remodeled and is called the Roamer, its Duesenberg engine being of the same type as that in the standard Roamer sport model.

RICK BACK IN CIVIL LIFE

New York, Feb. 28—Capt. Eddie V. Rick-enbacker has received his honorable discharge from the army and has returned to this city. Although the American ace of aces has received attractive offers from various interests he has not yet decided what business he will engage in.

UNWIN HEADS CHICAGO BRANCH

Chicago, March 3—Maj. Harry Unwin, formerly of the Ordnance Department, has succeeded H. J. Staebler as manager of the Chicago branch of Reo. Major Unwin long has been identified with automotive affairs, being credited with the origination of the system of road logging now used in so many touring guides.

GARAGE PLANNING

A New Feature of Motor Age

Suggested Layouts for Successful Service, Garage and Sales Buildings Begin Next Week

SO many readers have requested MOTOR AGE's assistance in planning the construction of new garages and sales and service buildings and the rearrangement of old ones that a special department to render this service will be very valuable to our subscribers. A mass of information has been accumulated in order that correct and specific plans and suggestions may be provided with as little delay as the volume of requests will permit. Many requests have been answered by letter already, and now we are all set for inaugurating this service as a regular feature

NEXT WEEK

Inquiries addressed to the Garage Planning Department will be answered by letter, accompanied by blueprints of our suggestions for lay-outs. Such of these as are of value to our readers in general will be published. No attempt will be made to give architects' detailed drawings—merely suggestions from which the architect may work.

Implement Combinations for Tractors

What Experts Advise According to Plow Capacity

COLUMBIA, Mo., Feb. 28—In the future the tractor salesmen who want to make a success in Missouri must give the farmer an individual demonstration on his own farm under his local conditions. At least that is what the farm engineering experts at the College of Agriculture under the direction of Prof. E. W. Lehmann are urging the farmer to demand.

"The Missouri farmers," said Professor Lehmann recently in a talk before a meeting of farmers at Columbia, "are coming to realize that a tractor will not fulfill its guarantee on every kind of soil and under all conditions to be met with in this state. Before purchasing a tractor the farmer should demand that an actual working demonstration be made on his own farm. This will prove definitely whether or not the tractor will develop its full power and will do the work which is claimed for it by the manufacturers and dealers. Of course, the agreement should be made beforehand that if the tractor does the guaranteed amount of work, properly and in the time set for it, the farmer will buy."

Tractor to Meet Conditions

This idea undoubtedly will take hold and meet with approval from the farmer, as it is being strongly advocated by many of the leading extension men in the rural engineering department. In the end the plan will prove profitable to the dealers and manufacturers, as it cannot help but result in a more widespread success with farm tractors than heretofore. The dealer does not, or should not, want to sell his machine to a farmer if it will not meet the needs and local conditions of his farm. If the dealer does sell to a farmer and the machine will not live up to its guarantee, it will result in a bad reputation for that machine in the locality.

The agricultural advisors and extension rural engineers in Missouri are recommending different combinations of machines to be used with the various-sized farm tractors. These recommendations are made for average conditions and cannot be used in all cases.

For the two-plow machine the following combinations of machines are recommended for use:

- Two 14-in. plow bottoms (average soil)
- One 9-ft. tandem disk harrow
- One 8-ft. drill
- One 10-ft. packer
- One 7-ft. tandem disk harrow and one 10-ft. spike tooth harrow.
- One three-section spike-tooth harrow
- One 4-ft. grain binder
- One corn binder
- One 8-ft. mower and one 6-ft. mower
- Two 8-ft. side delivery rakes
- One 12-ft. rake
- One two-row stalk cutter
- One 8-ft. hay loader
- One 60-bu. manure spreader
- One 10-bu. lime spreader
- One two-row lister
- One two-row corn cultivator
- One corn picker

For the three-plow tractor the following combinations should be used, according to the farm experts:

- Three 14-in. plow bottoms
- One 10-ft. tandem disk harrow
- One 8-ft. tandem disk harrow
- One 8-ft. spike tooth harrow
- One 7-ft. disk and one 7-ft. drill and one 8-ft. spike tooth harrow
- One 8-ft. binder
- One 6-ft. binder
- Two 8-ft. mowers
- Two 6-ft. hay loaders
- One 12-ft. drill
- Two 8-ft. packers
- One 8-ft. drill and one 8-ft. packer
- Three 12-in. plows and one 6-ft. spike tooth harrow

The four-plow tractor loads suitable for average conditions in the state are:

- Four 14-in. plow bottoms
- Four 12-in. plow bottoms and one 8-ft. spike tooth harrow
- One 8-ft. binder and one 8-ft. tandem disk
- Two 8-ft. grain binders
- One 10-ft. tandem disk and one 12-ft. peg-tooth harrow
- Two 10-ft. drills
- Two 8-ft. drills and one 12-ft. pegtooth harrow
- Three 14-in. plows and one 6-ft. disk harrow

SEES GOOD BUSINESS

Buffalo, N. Y., Feb. 28—Prosperous business for motor truck builders and dealers this year is predicted by W. A. Clare, general sales manager of the Atterbury Motor Car Co., who has just returned from a trip through the Middle West.

"Throughout the Middle West I found the demand for motor trucks increasing every day," he said. "When dealers in different cities showed me their present and prospective business I was astounded."

"I found in the Middle West, especially in states mostly devoted to farming, that money is plentiful, due to the fact that farmers expect a mammoth wheat crop with a guaranteed price of \$2.25 a bushel. They

are planning to spend their money for all kinds of improvements.

"The farm tractor, of course, has made a decided impression. Naturally, when the tractor goes on the farm the horse usually comes off, and the natural result is that farmers are buying motor trucks.

"Statistics show that in Kansas last year the value of the crops was \$425,000,000, in Nebraska it was \$400,000,000, and in Iowa it was \$825,000,000. Further statistics show us that in these states the cost of hauling corn was 33 cents a ton mile by horse against 18 cents a ton mile by motor truck. Progressive farmers everywhere are turning to the motor truck to solve their hauling problem. In the last six weeks the greatest amount of our business has come from territory west of the Mississippi river and the amount of business that is originating there is amazing."

ENGINES FOR EDUCATION

Washington, Feb. 28—The Senate has passed an amendment authorizing the loan of aviation engines and aircraft material to educational institutions. Two or three such institutions, including the College of the City of New York, have requested the War Department to lend them Liberty engines for the use of students. The War Department is willing to do this but has not had the authority. By this amendment the War Department has authority to make such loans at its own discretion, reserving to the Government the title to the engines and all other material.

PROSPECTS IN EQUIPMENT

Chicago, Feb. 28—E. Edelmann of E. Edelmann & Co., maker of motor car parts, recently returned from a ten weeks' trip to the Pacific Coast which has resulted in the following conclusions, as set forth by Mr. Edelmann:

The motor car business was the business during the war and will be for many years to come, one of the greatest and most remarkable

Program for N. A. D. A. as Outlined by Harry G. Moock, Business Manager

The divisional chairman and the committees named by dealers in each state will work with the N. A. D. A. headquarters to bring about uniformity of motor car laws and to eliminate unfair acts. We hope to make it so that motorists driving from one state to another will not be in danger of violating headlight, speed and license laws of which they know nothing.

The N. A. D. A. will foster the rural motor express, thus aiding to reduce the cost of living and to conserve the large proportion of food that is now wasted because of lack of transportation.

We hope to eliminate by education the irresponsible and careless members of the industry and to inculcate better business methods, cleaner shops, proper records and thereby raise the standards of business to that of older established lines.

Automobile stealing is receiving careful attention of our association which, through its legal department, will assist morally and financially to the end that the stealing of motor vehicles shall become a felony in all states. Encouragement and assistance will be given to prosecuting officers to bring about conviction.

The N. A. D. A. will work through civic and commercial bodies to enlist the help of citizens to eliminate careless driving, the thoughtless pedestrian, dangerous railroad crossings, short road curves and other dangers.

Insurance on motor conveyances is constantly mounting in cost. We hope through legislation to eliminate certain hazards and by education to change conditions so that premiums will be lowered.

industries that the twentieth century has brought forth. The motor car and its associate industries—accessories and equipment lines—will be prosperous, even though other industries may suffer a short period of depression.

There will undoubtedly be some readjustment of prices. Raw materials may decline some more, although at the present writing one of the most important raw materials used in the production of motor car equipment, namely, copper, has already reached almost a pre-war level, and a couple of cents more decline will make very little difference in the price of finished products using brass.

The jobber must buy merchandise in order to sell, and he must keep merchandise on his shelves so that he can fill all reasonable orders without delay.

His selling force he must keep in the field now more than ever, and advertising should not only be kept up, but increased.

The motor car accessory business during the summer of 1919 is bound to experience a wonderful boom, for the reason that the car manufacturers are once again building cars and most of the large manufacturers are planning considerably increased production.

BOSTON AGENCIES PLACED

Boston, Mass., Feb. 28—The best evidence that this is going to be a good motor season is shown by the way people are trying to get agencies for cars and the demand for machines now under way. Lexington closed with A. H. Sowers as distributor for the New England territory, and he has opened salesrooms on Bolyston street. An agency for the Elgin was placed with F. P. Vinn and H. A. Harris, the latter formerly with Oldsmobile, and they have located on Commonwealth. The Biddle has been taken on by the Guertin-de Rochmont Co., and they have taken the place formerly occupied by the Mercer, Frederick J. Caldwell. Jean Falk, formerly district manager for Saxon, and S. E. Baker, of the Dodge agency, have formed a company to handle the Saxon six.

The Denby Truck Co. has closed with Woodbridge, Inc., to handle the Denbys in Boston, formerly marketed by the Henley-Kimball Co. The Oneida truck has been taken on by the Aspinwall Garage Co. The Day-Elder truck will open headquarters here.

VULCAN SERVICE EXPANDS

Richmond, Ind., Feb. 28—The Jenkins Vulcan Spring Co., which at present has a floor space of 60,000 sq. ft. and a capacity of 400 tons a month, is erecting a new plant which will afford 125,000 sq. ft. of floor space and a capacity of 2000 tons a month. The road organization, which now consists of twelve men, is to be increased to twenty-five by June 1. Six selling branches and more than 600 dealer agencies now are maintained.

Motor Exports Double Pre-War Figures

Due Largely to Inability of Europe to Ship Machines

WASHINGTON, Feb. 28—Exports of passenger cars more than doubled over the pre-war annual exports during the war. This was due in large part to the inability of European manufacturers to supply cars for export trade. The war had a much more pronounced effect, however, on the exportation of motor trucks, which averaged 13,300 a year with an average annual total valuation of \$42,500,000, as compared with an average of 888 valued at \$1,459,000 for the fiscal years ended June 30, 1913, and 1914. Thus, the truck exports increased almost fifteenfold.

As the great majority of the trucks exported during the last four years were for military use by the European nations, it must be expected that shipments of trucks will drop almost immediately to somewhere near their former proportion to passenger car exports. This does not signify they will not be much larger than in the years before the war, both actually and relatively; on the contrary, they should be larger, just as sales of trucks in the United States will be larger, for American trucks have established their reputation and the world has begun to appreciate the importance of the truck as a means of quick and economical transportation.

Exports During 1918

A report of motor vehicle exports to all countries during 1918 by the Bureau of Foreign and Domestic Commerce shows that 10,308 trucks valued at \$26,814,952 and 36,936 passenger cars valued at \$36,278,292 were shipped abroad last year. In the fiscal year ended June 30, 1914, the last twelve-month period before the war, we exported only 784 trucks worth \$1,181,611 and 28,306 passenger cars worth \$25,392,963.

Analysis of the exports in 1918 as compared with 1914 shows that while the exports of passenger cars to England, France, Germany, Russia and British South Africa decreased notably and increased only slightly in Australia, they doubled to Canada, increased twenty-eightfold to Japan, twelvefold to Mexico, nearly ninefold to Chile and Spain, sixfold to Cuba and China, more than sevenfold to Uruguay, more than

quadrupled to the Dutch East Indies and almost doubled to Argentina.

Of the truck exports last year, on the other hand, more than half of the 10,308 went to England and France alone, while in 1914 less than a third of the 784 shipped abroad went to these two. There was hardly any country in the world that did not take more American trucks last year than four years ago. The ratio of increase was much greater than in the case of the passenger car even to countries outside of Europe. Japan, the Philippines, Dutch East Indies, Cuba, Mexico and Peru are becoming truck using countries.

American cars and trucks are now being exported to seventy-five different countries, colonies and dependencies, including Iceland and the Faroe Islands, Labrador, the Barbados, Aden, Chosen, Persia, Siam, Canary Islands, Madagascar, nearly all countries and to innumerable islands in the South American and Central American East Indies and Oceania.

STANDARDS OF GASOLINE

Washington, Feb. 28—In appealing to the governors of the various states for co-operation in standardizing petroleum specifications for the entire country, letters have been sent to the governor of each state containing memoranda as to the laws for gasoline inspection in each state along with the bulletins issued by the Committee on Standardization of Petroleum Specifications. This committee has been investigating the subject for months, and a series of standards gradually are being developed, which are put out from time to time in bulletin form.

According to the committee, the variety of standards prevailing in different localities tends to raise the price of gasoline and other petroleum products for the consumer. Common standards it is believed would result in better service as to both test and quality for the public. In this communication to the state governors it is also pointed out that although the fuel administration will cease to function after peace is declared, the Committee on Standardization of Petroleum Specifications will continue for six months after that time.

Motor Vehicle Exports in 1914 and 1918

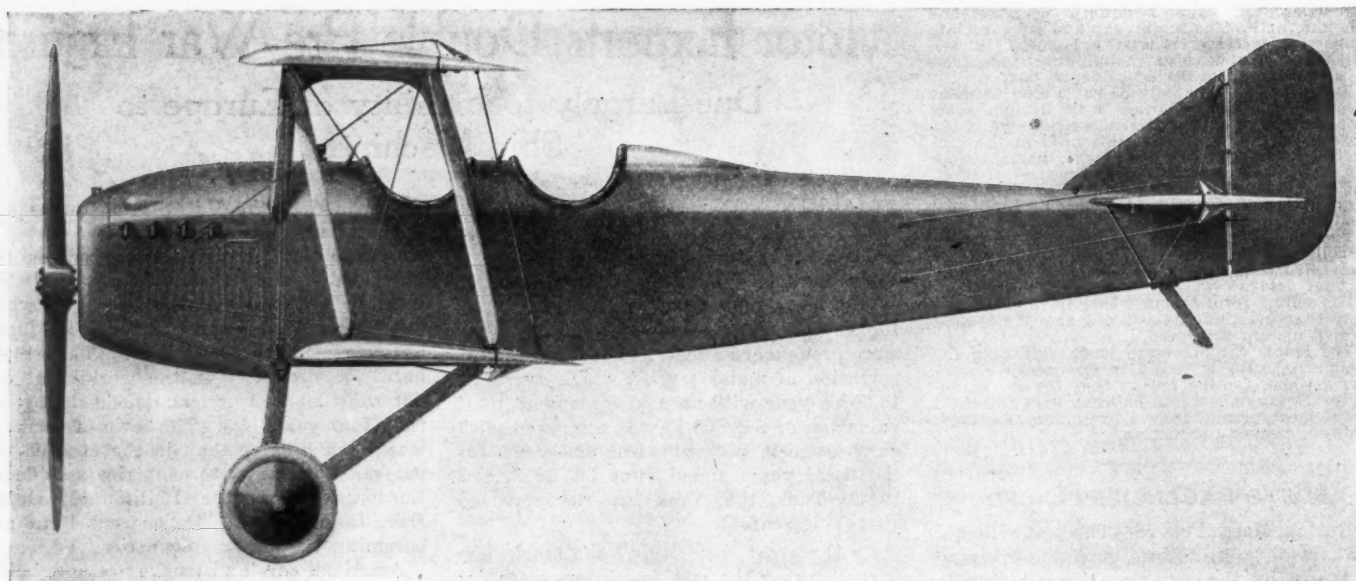
EXPORTS OF PASSENGER CARS IN 1914 AND 1918

COUNTRY—	Twelve months. Ended Dec. 31, 1918		Twelve months Ended June 30, 1914	
	No.	Value	No.	Value
Canada	8,543	\$ 7,141,405	4,377	\$ 5,445,052
Australia	3,826	3,271,317	3,099	2,615,896
Japan	2,699	2,877,693	96	100,995
Mexico	1,915	1,539,266	155	239,166
Chile	1,734	2,315,386	195	160,194
Cuba	1,780	2,638,001	297	254,428
Philippine Islands	1,690	1,462,571	614	697,175
Argentina	1,628	1,673,137	940	963,586
New Zealand	1,418	1,228,864	1,065	974,708
Uruguay	1,351	799,787	183	167,269
British South Africa	1,205	1,070,570	1,618	1,437,883
Dutch East Indies	1,260	1,567,766	290	208,722
Brazil	1,108	856,374	299	264,992
France	1,003	1,134,818	1,427	919,060
China	874	896,728	144	143,619
Spain	808	1,042,788	83	64,758
Germany .....	.....	.....	1,411	1,040,787

England	398	997,342	6,992	5,615,487
Russia (Europe)	10	8,325	926	898,458
Other countries	3,686	3,756,256	4,094	3,180,728

EXPORTS OF MOTOR TRUCKS IN 1914 AND 1918

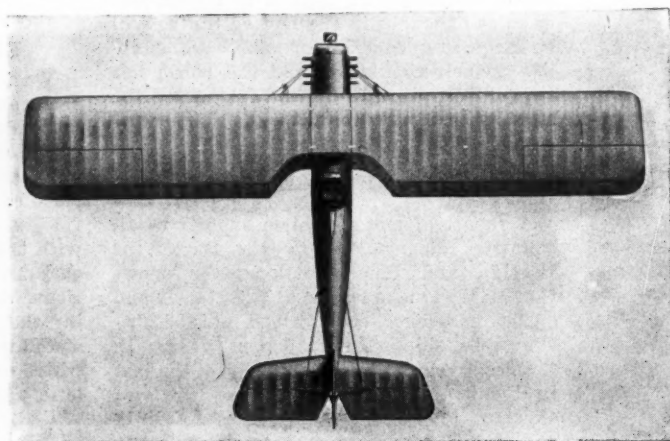
COUNTRY—	Year ended Dec. 31, 1918		Year ended June 30, 1914	
	No.	Value	No.	Value
France	3,356	\$12,920,029	2	\$ 5,070
England	2,080	5,999,541	203	189,099
Canada	1,596	2,035,464	247	474,724
Japan	605	895,125	1	900
Cuba	557	1,109,368	19	33,500
Mexico	397	524,035	12	17,509
Chile	154	239,621	2	10,743
Dutch East Indies	154	335,536	7	14,232
Philippine Islands	152	205,519	38	64,805
Norway	108	320,574	2	3,852
Scotland	182	667,413	.....	.....
Peru	100	246,393	3	5,301
Other countries	864	1,336,334	248	361,876
Totals	10,308	\$26,814,952	784	\$ 1,181,611



Side view of Packard airplane which is to sell at about \$15,000 and which will be marketed through the Packard dealer organization

Packard's Commercial Sport-Type Plane

To Be Marketed
Through Its Reg-
ular Dealer Or-
ganization Over
Whole Country



Plan view of the Packard airplane

Two - Passenger
Eight or Twelve
Good for 100
M.P.H. High
Safety Factor

BASED on the assumption that in this country there are hundreds of wealthy sportsmen to whom flying would appeal, the Packard company has designed and brought out its first line of commercial airplanes. These will be made at first in limited quantities and marketed through the Packard dealer organization. Some of the dealers already have placed their orders for planes and are now reporting sales to users, as told previously in MOTOR AGE.

Packard is not in production on this plane, but probably will go ahead with its manufacture. In this event, before placing the plane actually on the market, exhaustive sand tests and other tests will be made under official supervision. No price has been set on the plane as yet, but it is understood that it will sell somewhere around \$15,000.

Arrangement of the machine, which is a two-passenger biplane, is shown in the sec-

tional illustration. It will be noted a clothing compartment is provided, also a suitcase compartment to carry two suitcases which will be found very convenient in cross-country traveling. The plane illustrated herewith has been designed around, and to be a complete unit with the 1-A-744 engine, which is an eight-cylinder type of 160 hp. at 1525 r.p.m. There are also two twelves which may be fitted.

It is estimated that the plane will fly

Specifications Packard Airplane

POWERPLANT
Packard eight-cylinder, 160-hp. engine; 160 hp. at 1525 r.p.m.
Weight, complete with propeller hub, self-starter, battery and engine water—585 lb.
Fuel consumption, .50 to .54 lb. per horsepower hour at sea level.

WING AND CONTROL SURFACE AREAS
Main planes, total..... 387 sq. ft.
Ailerons, total..... 48 sq. ft.
Vertical fin..... 5 sq. ft.
Rudder..... 11 sq. ft.
Tail plane..... 30 sq. ft.
Elevator, total..... 22 sq. ft.

WEIGHT
Machine empty..... 1520 lb.
Gasoline..... 210 lb.
Oil..... 30 lb.
Water..... 52 lb.
Tools and extras..... 25 lb.

Pilot..... 165 lb.
Passenger..... 165 lb.
Normal flying weight..... 2167 lb.
Weight, pounds per horsepower..... 13.5 lb.
Wing loading per square foot..... 5.6 lb.
Permissible extra luggage..... 100 lb.

PERFORMANCE
High speed near sea level..... 102 m.p.h.
High speed at 5,000 ft..... 100.5 m.p.h.
High speed at 10,000 ft..... 98 m.p.h.
High speed at 15,000 ft..... 90.5 m.p.h.
Climb to 5,000 ft..... 7.5 min.
Climb to 10,000 ft..... 18.1 min.
Climb to 15,000 ft..... 34.5 min.
Absolute ceiling..... 19,500 ft.
Fuel range wide open near sea level..... 2.5 hr.
Fuel range wide open at 5,000 ft..... 3 hr.
Fuel range wide open at 10,000 ft..... 3.5 hr.
Fuel range wide open at 15,000 ft..... 4 hr.

about 100 m.p.h. with full load on account of its comparatively light weight and clean-cut design. The landing speeds have not yet been determined, but it is claimed that they will be quite low and probably about the same as the usual primary training machine. To further facilitate landing in unknown and rough fields, the landing gear is located well forward to guard against nosing over, and a rugged tail skid is provided to take care of unusual strains.

Pilot's Cockpit

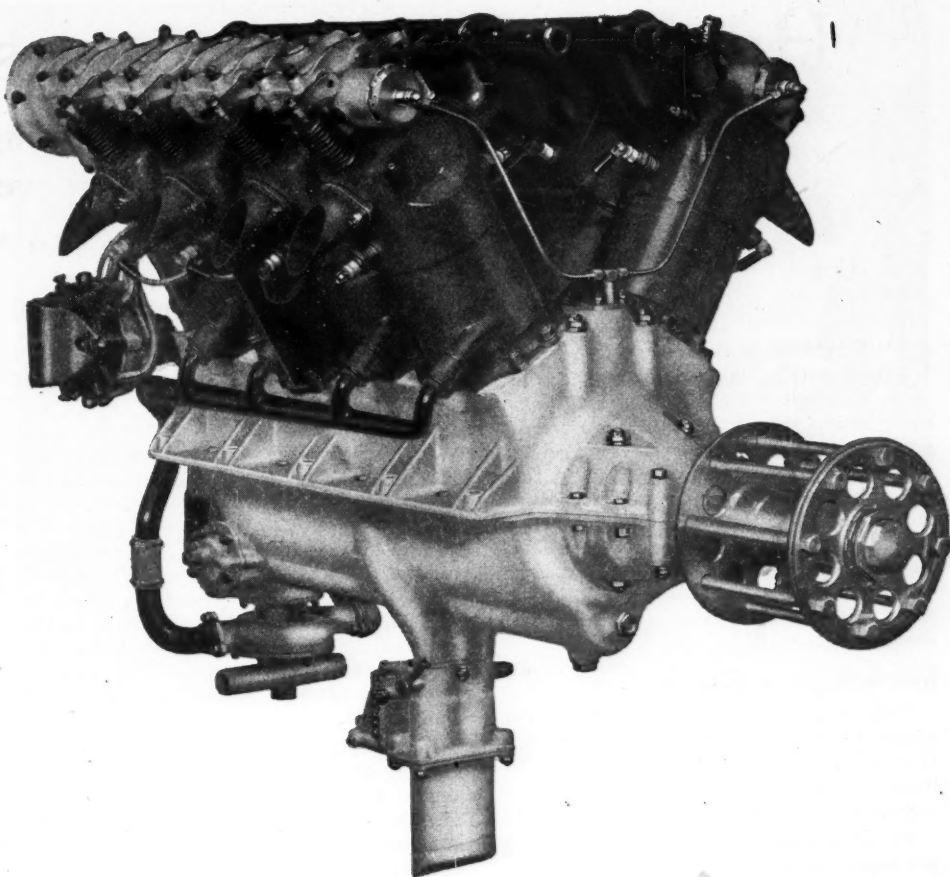
The rear cockpit is arranged especially for the pilot, but the necessary dual controls are provided, so it can be flown from the front seat, thus making it possible to use this machine for instruction work when desired. The controls in the front compartment can be lifted out quickly, making it impossible for the passenger to interfere with the control of the plane, should this be desired. The gasoline tank is located between the passenger and the engine. This location at approximately the center of balance of the plane takes care of the variations in the weight of the fuel without interfering with the balance of the machine.

It has been the aim of the Packard engineering department to incorporate the best features of the Packard and Liberty aircraft engines developed before and during the war.

Any one of three engines of similar design may be fitted. Two of the models, known as the 1-A-744 and the 1-A-1116, use the same $4\frac{3}{4}$ by $5\frac{1}{4}$ in. cylinders, the 1-A-744 being an eight-cylinder and the 1-A-1116 a twelve. In addition, there is a larger engine, using twelve $5\frac{3}{4}$ by $6\frac{1}{2}$ in. cylinders. They are all V-type engines with an angle of 60 deg. In a great many respects the engines follow the design of the Liberty, particularly in respect to the manner of taking the drive off the crankshaft for the overhead camshaft.

The carbureter is located on the bottom of the crankcase, with intake passages carried through the case. This has resulted in a very low carbureter, making possible the use of gravity feed. At the same time the intake passages are kept properly warmed and the weight required for waterjacketing the intake is eliminated. Furthermore, removing the carbureter from the V leaves the space between the cylinders entirely clear, giving greater accessibility for the spark plugs and providing for unusual vision.

The starting motor also is placed very



Three-quarter view of Packard airplane engine, illustrating low mounting of distributor heads, water pump, carburetor and accessible position of spark plugs

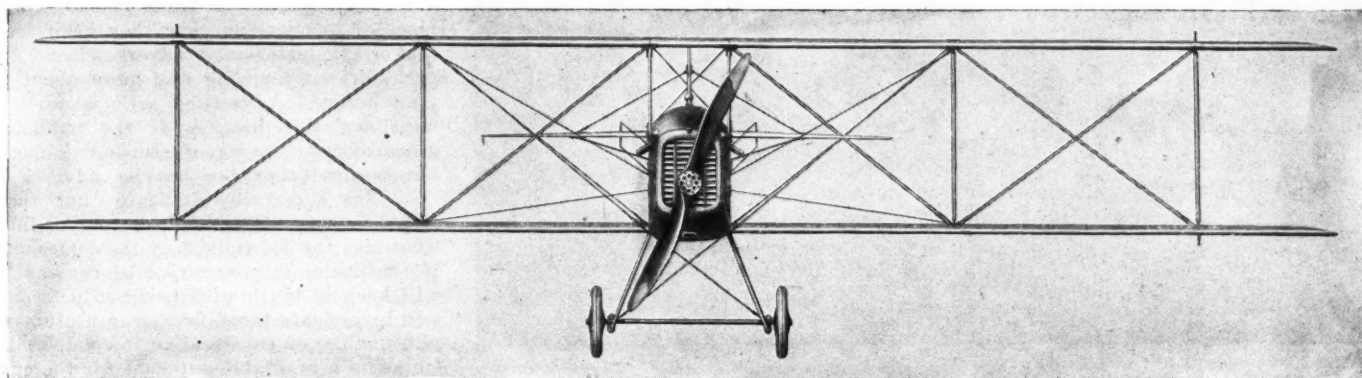
accessibly, being located on the rear of the engine and quite low. Accessibility has been made a prime factor in the design, and there is nothing which cannot be reached with ease and without removing any other part. Lubrication is by full pressure feed, the system being very similar in many respects to the Liberty engine lubrication, the camshafts being taken care of by independent leads through the hollow shafts.

Ignition is by the Delco system, which incorporates the newest Delco improvement in which the head remains stationary and the spark advance is secured by advancing the driveshaft. Complete double ignition is supplied to two sets of spark plugs, and the engine will function properly on either set. The ignition distributor heads are easily accessible from each side of the fuselage.

Weight has been carefully worked out in all three engines. The eight-cylinder engine weighs 520 lb. complete, the smaller twelve, 710 lb., and the larger twelve, 1000 lb. The weight of the engine is given complete with the propeller hub, carburetor, ignition distributor heads, ignition switch, generator, starting motor and starting switch.

Safety Factor

The plane, being utilized for sporting purposes largely or for cross-country fast passenger transportation, has been designed for safety and speed, and at the same time care has been given to have reasonable economy and comparatively low landing speed. It is designed to make use of the very best materials obtainable and has a factor of safety of over seven. This is exceptionally high in plane construction.



Front elevation of Packard airplane, showing wing span and noteworthy absence of parasitic elements

How to Promote Accessory Sales

Methods You Can Use in Establishing a Department With View to Rapid Turnover of Stock

Article III in Over-the-Top Series No. 2

By T. P. Bowman

HOW often it is that someone drives up to a garage, jumps out of his car in a hurry and says, "I want a spotlight put on right away." Or it may be any other of a great many demands. How often the garageman must advise the motorist that he is very sorry but he hasn't a spotlight or whatever the article may have been. In fact, no matter what article may have been asked for in the way of an accessory he would have received the same reply because the garage carried no stock of accessories whatever.

Accessories Draw Business

This prospective customer will go elsewhere to obtain whatever he wanted at that particular moment, and it is not unlikely he will go there when in need of anything in the accessory line.

The garageman, when asked why he does not handle a line of accessories will reply by saying that this concern or that concern is handling a line of accessories and that everybody goes there when in need of anything. This is very true in an instance of this kind, but why is it true? What explanation can the garageman give for this state of affairs? He can give none, except, that so and so put in a pretty complete line and everybody got in the habit of going there and it's pretty hard to

change them now. Undoubtedly, it is true that everybody has acquired the habit of going there, and it also is true that it will be a difficult problem to direct the accessory buyer to the garage instead of permitting him to go to a grocery store or hardware store. While the task is by no means a small one, it is possible, and it is one of the possibilities which must not be overlooked by the garageman if he is to receive the benefit of those lines closely allied with his business to which he is rightly entitled. No matter what season may just have passed or what season is just approaching there is no time so valuable as the present.

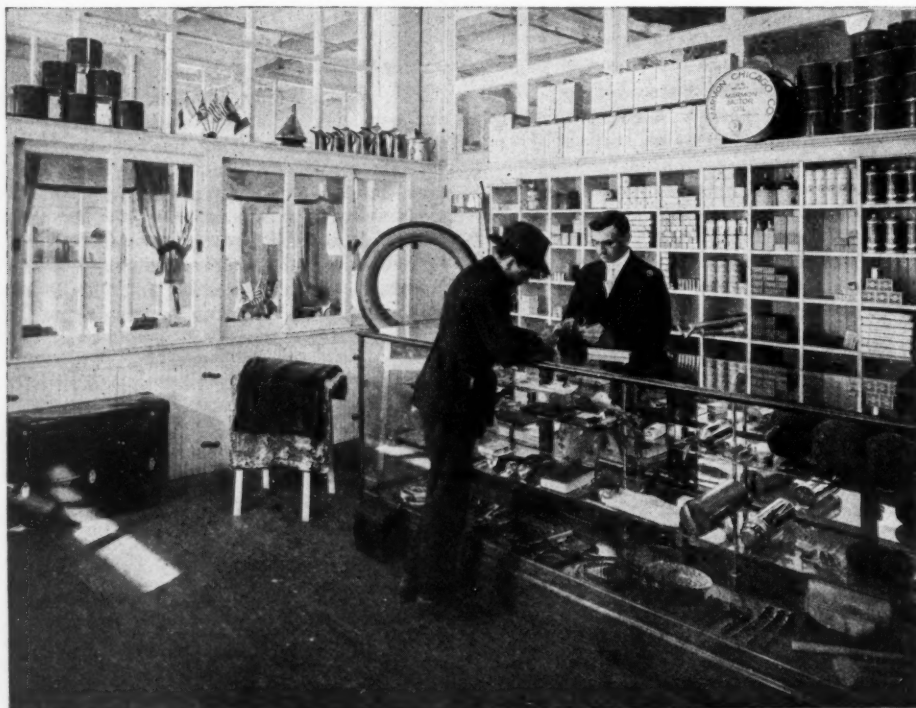
In opening an accessory department the amount of business which may be expected should be considered. It would be inadvisable to purchase a \$5,000 stock of accessories when the yearly turnover would not exceed that amount. It also would be inadvisable to stock up in too small an amount when it is expected that the yearly turnover will be large. The size of department should be based upon two things, the estimated amount of business for the year, and the assortment necessary to make the line complete. When speaking of a complete line it might be estimated that a certain list of accessories would be prescribed which would serve as a guide for

the prospective accessory dealer, but this cannot be done. Each community, district or territory is individual in itself as an accessory sales center. Certain accessories are considered an absolute necessity, and purchasers will demand them because of that fact. Again various accessories, while useful, may be added as a matter of particular taste and with the idea of presenting a certain degree of distinction. For the dealer in the small town whose patronage would consist mostly of owners of moderate-priced cars the necessary articles only would be advisable. The very few calls which may come for something out of the ordinary better would be handled by special order rather than have them in stock for months with no prospect of selling them at all. The city dealer, with patrons in practically all classes of trade, must stock in accordance with the varied tastes of his customers. The accessory dealer who must reach out for this class of trade must put a great deal of time and study into the accessory department. Extremely good judgment must be used in the purchase of every article. A special study must be made of the trade in general. To attempt a big business or increased business depends entirely on the extent of the dealer being able to supply the customers' demands.

Two Ways of Business

Of course, there are two ways of doing this, one being to purchase everything on the market, and the other being to purchase as nearly as possible what the trade will demand and in addition anything that is known to be of value to the customer whether he demands it or not. Do not hesitate to purchase a moderate quantity of anything which you know has sufficient merit to warrant the satisfaction of the customer. Through your salesman you can create an interest in the article and its merits will be sufficient recommendation to care for the rest.

Do not permit your trade to enter your place of business and say they have seen this or that extensively advertised and depart without knowing any more about it than before. Advertised articles are the most desirable because of the publicity given them by the manufactures or jobbers, but because they are heavily advertised does not necessarily indicate that they would be a profitable addition to your line. That must be determined by the dealer and if the dealer is progressive he constantly will keep in touch with new products and will investigate them, first as to usefulness and quality of construction, second, as to its being a profitable purchase for the customer and, finally, its profit as a dealer's proposition.



Neat, attractive displays go a long way toward making an accessory department a success and are expert salesmen, even though silent

Then when a customer demands some new product which he has seen in the advertising columns of some paper the dealer has either got it in stock or knows that it is not as represented or whatever the reason may be for not having it. When the customer departs he feels satisfied he has obtained what he wanted or has not obtained it for reasons which satisfy him that he doesn't want it. One can hardly realize to what an extent the dealer can acquire the confidence of his trade in being able to treat them in this manner except for the increased patronage realized, which, of course, is the dealer's main object.

Attractiveness has been, and is in the majority of garages and service stations, very much in want. It would appear to the casual observer that a certain effort had been put forth in the way of concealing the accessory department and articles in it. In some cases the ambush consists of stacks of boxes, pieces of machinery and mostly half an inch of dust and dirt which may be found in plentiful quantities on the show-cases, shelving and ornaments, if there are ornaments in view.

There is nothing so disgusting as dust and dirt on showcases and exposed articles. Carelessness seems much in evidence, and a reflection that tends to convince one the stock is old and undoubtedly not very much in demand is created. Dust or dirt on any article is an appeal from the article to leave it where it is. When a business appeals to customers in that light it is quite certain they will locate some other place to deal, even though the dusty and untidy line may be more complete and of better quality.

Remove All Foreign Matter

The first thing to be done in the way of making the accessory department of interest is to remove everything which has no bearing or relation to that department. After commencing a general cleanup in this direction the question may arise as to where the foreign material may be stored. Do not let that obstacle stand in the way of removing everything which does not belong there. It is possible very little stock has remained after the cleanup. This goes to show the department has decreased without the knowledge of the person whose duty it is to keep it stocked and in shape.

Location of the accessory department is a very important consideration, and the department should be given first choice of any available space. To locate the department in a remote part of the building, where no one notices it unless directed to it, is depriving the department of advertising it should receive on account of its attractiveness. Glass showcases are a very valuable addition because of their permitting a very neat display of articles and at the same time keeping them free from dust and dirt. Shelving should be erected in a very attractive manner and allow sufficient space to permit the display of everything that goes on a shelf.

Enough showcase space should be provided to permit the display of articles without bunching or crowding them. Of all the evils of display, that of attempting to show too much in a given amount of space is the most widely practiced, principally because of not having enough showcase room or ignorance on the part of the one making the



Glass showcases not only make for neat accessory displays but they keep accessories free from dust at the same time

display. The tendency to make a storehouse of a showcase gradually is being done away with, but it is still persisted in by some dealers who are satisfied with obsolete methods of all descriptions. The dealer who is aggressive, however, is very prompt to accept the better and more attractive way.

Much the same could be said of the show window. The show window should be treated for even greater attractiveness than the showcase. Nearly every customer who enters the place of business has noticed the show window, and nearly every customer of your competitor also has noticed it and will continue to notice it. A show window is a key to the character of the business. The impression created by it is either good or bad. The more attractive it is, the better the impression. The less attractive it is, the greater reflection on the system employed behind it.

MORE AID FOR DEALERS

St. Louis, Feb. 28—The N. A. D. A. is going to have an attorney on its staff. Not that a run of litigation is expected, but Business Manager H. S. Moock has concluded that if there is any one thing the motor car dealers need to-day it is a man to answer their questions which border on the legal, if not entirely legal. Also he has been unable to put his hands on anything that looks like an intelligent digest of the various laws of the states and cities governing and affecting motor cars.

Not a day has passed since the Chicago meeting that has not brought to the N. A. D. A. offices questions that have a legal tinge. Usually the writers say their attorneys have been unable to find this information in the books available to them.

In addition to answering these questions this attorney will be expected to prepare a motor car law code and to pave the way for the greater work that is to come of ob-

taining more uniform motor car laws in the states and cities.

Just now, with so many legislatures in session, the prospective laws are a big factor in the thoughts of the leaders of the trade. From Georgia and Washington have come requests for tax information that will enable representative dealers to appear before legislative committees. It is safe to say that there is not a legislature in session that does not have before it some perfectly impossible draft of a proposed law. Many of these are well meant and will be withdrawn or killed when the absurdity is shown, but each constitutes a danger and a reason for having at hand the proper argument to meet the danger.

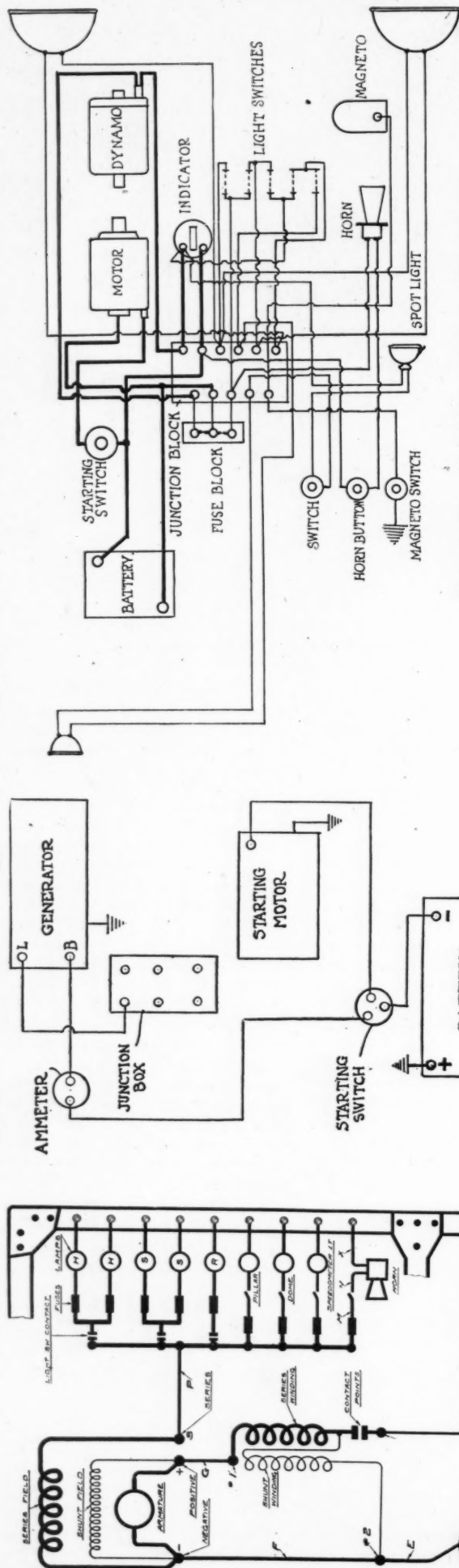
The new N. A. D. A. offices are well suited for departmental work. The suite originally was planned as a fine flat. Manager Moock has the parlor. The stenographers work in the living room. The bookkeeper is in the dining room. The kitchen is for the attorney and the hall bedroom is a stockroom. The rooms are cheery with grate fires.

HORSE BUS TO PASS

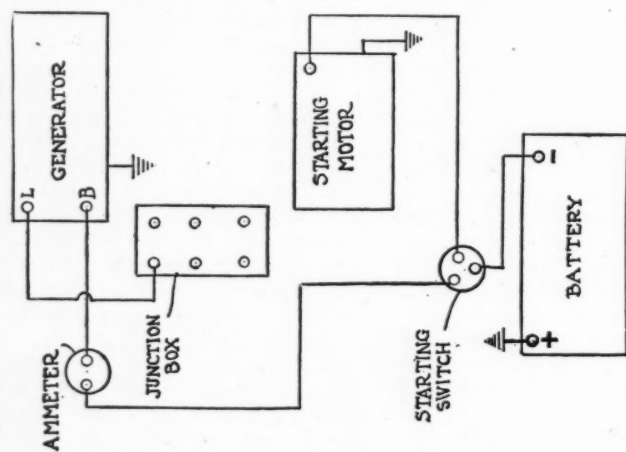
Chicago, Feb. 28—It is written that the horse-drawn bus shall join its brother, the horse-drawn streetcar. So be it, and selah! Such is as should be. Which is to say the horse-drawn bus that for sixty-five years has rambled between Chicago railroad stations and Chicago hotels is about to ramble back to the woods. The Frank Parmelee Co., exclusive operator of the horse-drawn buses, has ordered \$500,000 worth of electric buses, and the change is to be made the latter part of the year. It is expected that eventually all the baggage transfer wagons also will be motorized.

The growing unwillingness of people as a whole to ride in the horse-drawn buses is given as the reason for the change.

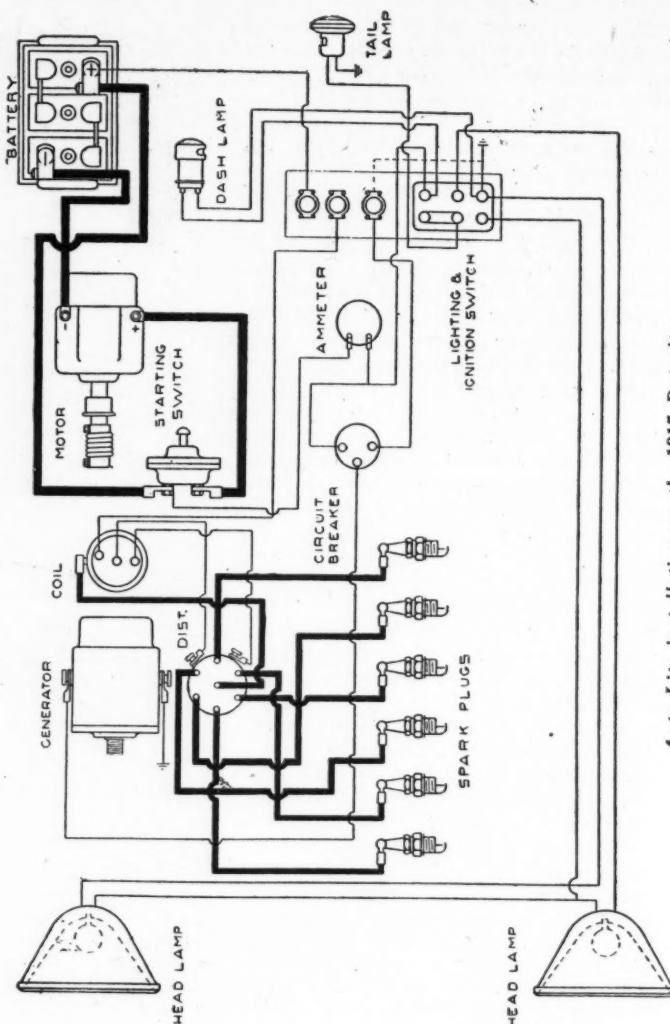
Motor Age Wiring Diagram Chart No. 18



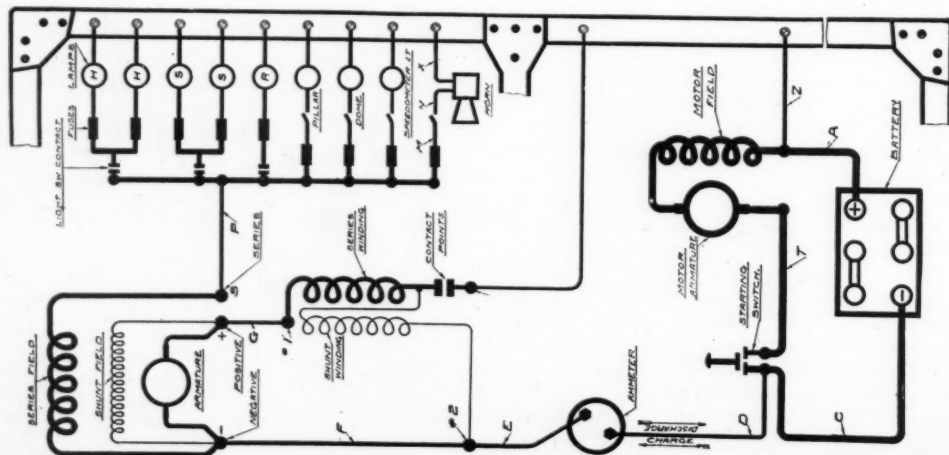
Bijur starting and lighting system on 1915 Apperson



Westinghouse system on 1914 Marion, showing ammeter



Auto-Lite installation on the 1917 Detroit



Gray & Davis on 1917 Apperson

- | | | |
|-------------------|--------------------|-----------------------|
| Alter—Nov. 14 | Ford—Jan. 30 | Mitchell—Jan. 9 |
| Buick—Nov. 21 | Grant—Feb. 27 | Oakland—Jan. 2 |
| Cadillac—Dec. 19 | Hudson—Dec. 5 | Oldsmobile—Jan. 23 |
| Case—Feb. 27 | Hupmobile—Feb. 13 | Overland—Nov. 7-14 |
| Chalmers—Feb. 20 | Krit—Feb. 6 | Regal—Feb. 6 |
| Cole—Jan. 23 | Locomobile—Jan. 23 | Reo—Feb. 27 |
| Chevrolet—Nov. 28 | Marmon—Jan. 9 | Scripps-Booth—Dec. 26 |
| Dodge—Dec. 12 | Maxwell—Jan. 16 | Studebaker—Dec. 26 |
| Elgin—Feb. 27 | Mercer—Jan. 23 | |

What to Do with Those Car Brakes

When Squeaks Say, "I Need Care!"

GOOD service is that which results in as nearly complete satisfaction to the owner as is possible—and it will bring its reward in the long run. Little disputes may arise over what the owner imagines excessive charges or something of the kind, but after he has patronized the other fellow, of whom he has heard, he is apt to go back to the original good service place and then stick.

Service men easily may ally themselves with the safety-first movement and perhaps be the means of preventing many bad accidents, if not material damage—by making it a practice to suggest to the car owner the advisability of regular and frequent examination of both sets of brakes on his car. If it happens to be a garage, the opportunity of brake inspection comes more readily, and in all events the suggestion is only necessary to obtain an order to have the work performed.

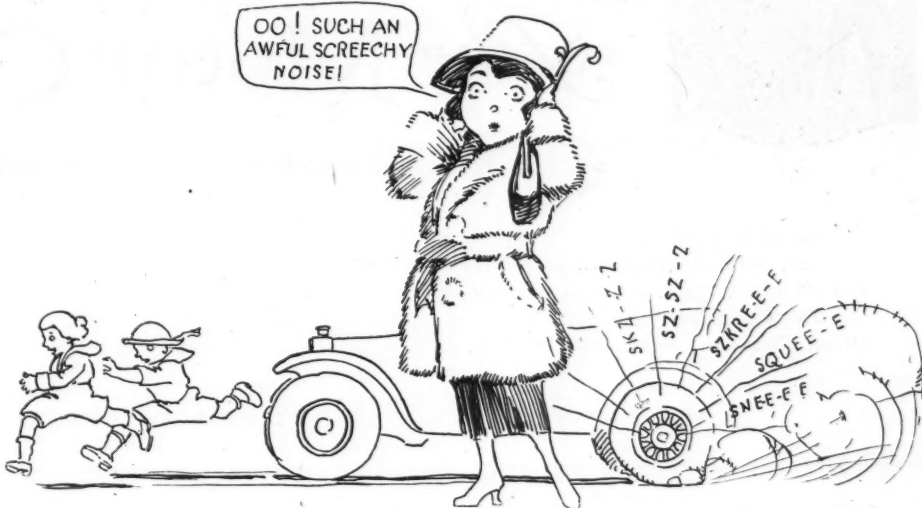
Poorly-acting brakes have been responsible for more accidents, more property damage and more disaster than any one thing connected with the motor car or with driving it, and any reasonable amount of money spent on the brakes will earn the biggest kind of dividend in a short and, generally, unexpected time.

It must be remembered that either service or emergency brake should perform its functions thoroughly—one quite as well as the other, so that if one does happen to fail the other can be used. It is not enough to have one working and the other failing, because the owner never knows when something will happen to make one inoperative.

It will require perhaps 10 or 15 min. to go out on a side street and test the brakes. Roughly, each brake should prove its ability to stop the car correctly under the following figures:

Car speed	Car should stop in
10 m.p.h.	10 ft.
15 m.p.h.	20 ft.
20 m.p.h.	38 ft.
25 m.p.h.	57 ft.
30 m.p.h.	85 ft.
35 m.p.h.	100 ft.
40 m.p.h.	150 ft.
50 m.p.h.	225 ft.

Remember, each brake should be capable



of upholding these figures and not merely be somewhere near them. It will require two persons to make the test satisfactorily, one to drive and apply the brakes, the other to watch the speedometer and give the signals when to apply brakes and note where the car is brought to a complete stop.

A well-defined chalk mark on the pavement should be made for the starting place. The driver will approach this at a predetermined speed, say, 20 m.p.h., the usual driving speed. Just as the car reaches the mark the observer drops his hand as a signal to the driver, and the latter immediately declutches and applies the brake. The distance the car travels is, of course, easily measured.

Brake Linings

Brakes cannot be adjusted properly unless the lining material is kept in good condition, and it is not in that state if allowed to become hard and glossy. Whenever you hear screeching brakes make up your mind those brakes need attention and unless they have it an accident may be the result.

Once in two months the rear wheels ought to be removed entirely so the brake bands may be washed off thoroughly with kerosene to remove accumulated oil and grit. It is best to jack up the rear axle and have both wheels off at once. Then while

the bands of one are being given their first application of kerosene those on the other side are soaking and the kerosene is eating into and softening the grease. At the same time the pores of the lining material are being opened and the fiber of the material is swelling.

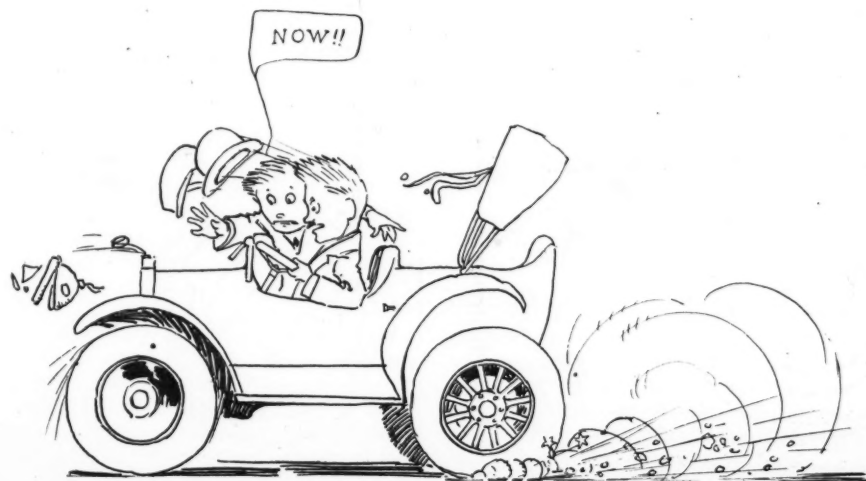
A few moments after the kerosene has pretty well disappeared, apply ordinary lubricating oil, seeing that it is thoroughly smeared all over and is permitted to remain until the material absorbs it. This process, as a matter of fact, should be performed at night, when the car is not to be used, for then the oil will have had a chance to get well into the fabric and thereby will keep it from absorbing water and grit. At the same time it will keep the material expanded that much longer.

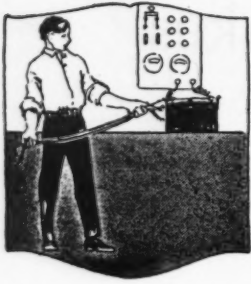
After the surplus oil, if any, has been wiped off and the wheels replaced, the owner will be astonished at the way the brakes will take hold and what slight pressure of the foot is needed to make them perform.

Oil Once a Week

An application of oil once a week will keep the brakes in condition, and this is only a moment's work. It will not be necessary to remove the wheel or to have anybody help. It calls for putting plenty of ordinary lubricating oil on the service brake bands, starting the engine, running the car back and forth in the garage or on the street and keeping the service brakes gently set so the oil will be carried by the brake drum to all parts of the band.

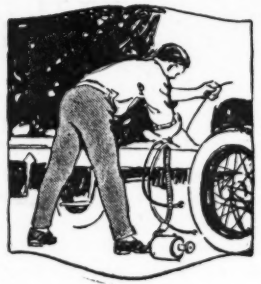
Moving back and forward only a few feet is as good as going a block, and the slowest speed possible is necessary, for it must be remembered that the brakes will not yet hold and an accident might result. In the morning the surplus oil may be wiped off and the car taken out with the absolute knowledge that the brakes will work perfectly if they are kept in adjustment. Of course, it is the service brake that needs the once-a-week treatment, for the emergency brake is inside the drum, gets some oil frequently from the axle housing and anyhow is protected to some extent.





Electrical Equipment of the Motor Car

By David Penn-Moreton & Darwin S. Hatch.



Editor's Note—Herewith is presented the 136th installment of a weekly series of articles begun in MOTOR AGE, issue of June 29, 1916, designed to give the repairman and motorist the knowledge which will enable them to care for and repair any and all of the electrical features of the car, no matter what make or model it may be.

The first half of this series has been published in book form by the U. P. C. Book Co., Inc., 243-249 West Thirty-ninth street, New York, and is sold at \$2.50. The remainder of the series will be published as a supplementary volume.

Part CXXXVI—Remy Electrical Systems

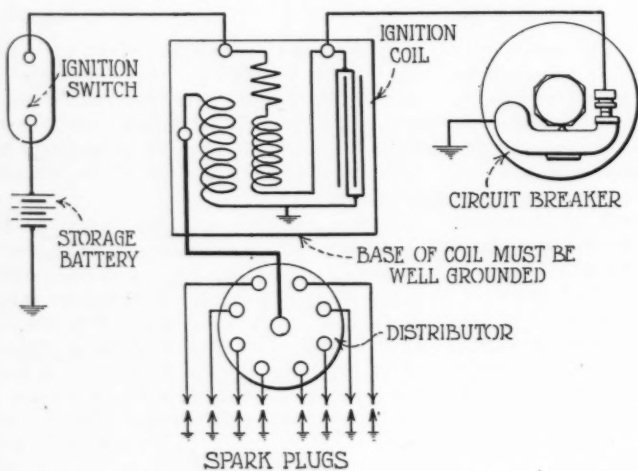


Fig. 689—Wiring diagram of Remy grounded ignition system

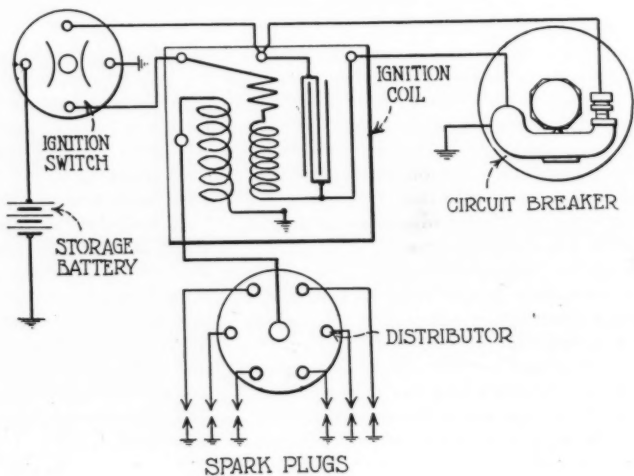


Fig. 690—Wiring diagram of Remy insulated ignition system

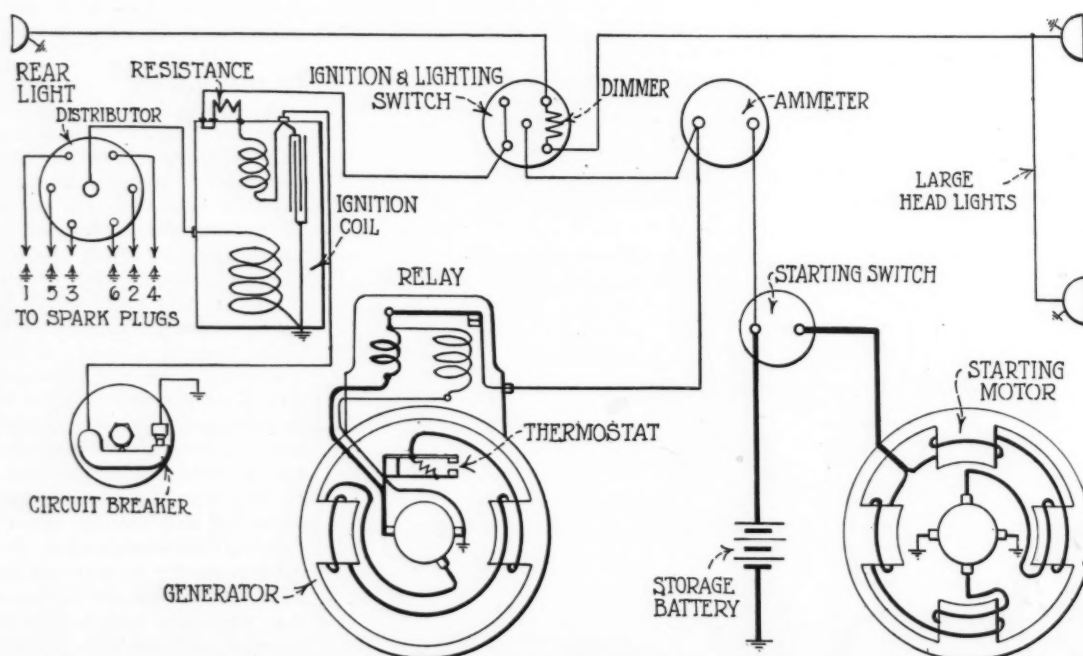


Fig. 691—Remy electrical installation on the Oakland 34-B

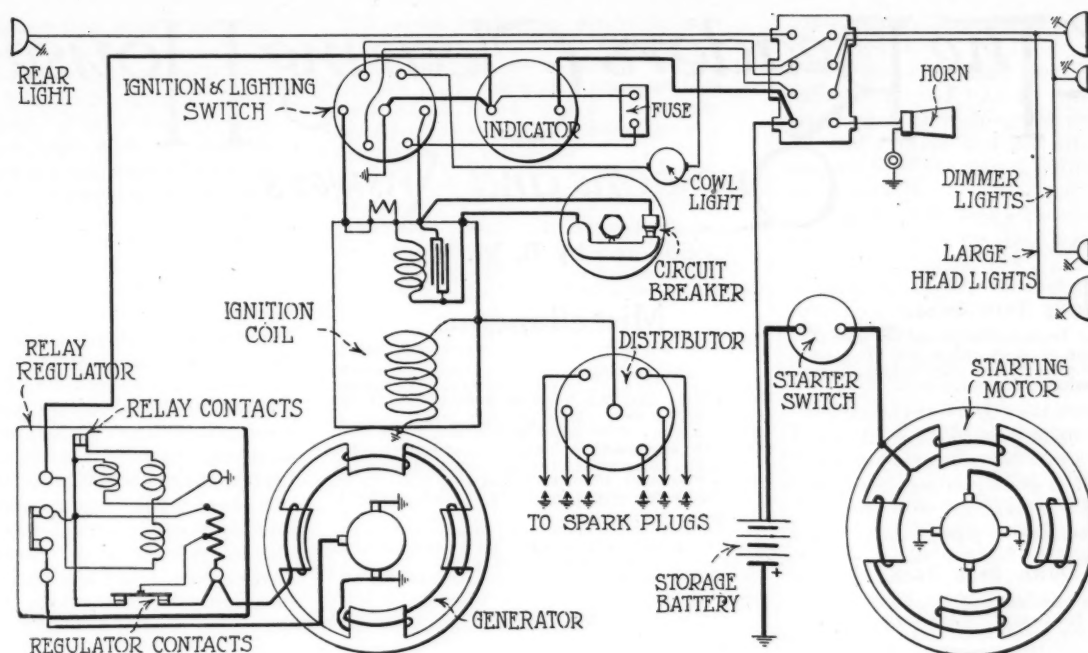


Fig. 692—Remy electrical installation on the Velie 28

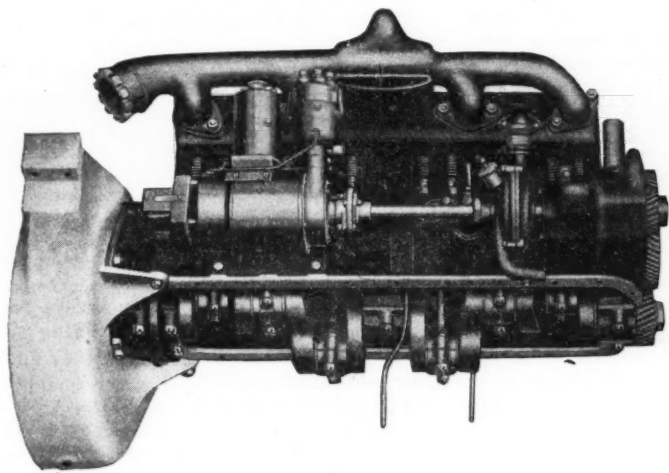


Fig. 693—Side view of Remy installation on Velie 28

A RESISTANCE is used in series with the primary winding of the ignition coil on many of the equipments, such as on the Velie, Chalmers, etc. This resistance is mounted on top of the coil tube, its action being to allow a strong current to flow for starting when the engine is cold. Then as the resistance heats up and increases, due to heat, the current is reduced. This resistance, though operating very successfully under normal conditions, is likely to be burned out if the ignition switch is forgotten and left on when the engine is not running. It therefore is installed on top of the coil, where it is readily accessible for replacement. The wiring diagram of a grounded ignition system is shown in Fig. 689, and an insulated system is shown in Fig. 690.

Remy makes several different types of magnetic ignition systems in addition to the battery ignition systems.

Three methods of dimming the headlights are used on Remy equipments. On the Reo the lamps are connected in parallel for

bright lights and in series for dim lights. On the Velie and others, auxiliary small lamps are used for dim lights. On McLaughlin, Oakland and others a resistance is cut into the lamp circuit for dimming.

Remy on Oakland 34B

A wiring diagram of the Remy installation on the Oakland 34B is shown in Fig. 691. It is a three-unit single-wire 6-volt system, with the positive side of the system grounded. The output of the generator is regulated by a combination of the third-brush and thermostatic methods. The electromagnetic cutout is mounted on top of the generator. The ignition system is of the grounded type, and it, as well as the lights, is controlled by a combination ignition and lighting switch mounted on the dash. The headlights are dimmed by introducing a resistance in series with them, the lamps themselves being in parallel. An ammeter on the dash indicates the charge or discharge current of the battery, except current taken by the starting motor. A Bendix drive is used in engaging and disengaging the starting motor with the engine automatically.

Remy Installation on Velie 28

A wiring diagram of the Remy installation on the Velie 28 is shown in Fig. 692. It is a two-unit single-wire, 6-volt system, with the positive side of the system grounded. The output of the generator is regulated by an electromagnetic regulator, which intermittently introduces a resistance in the shunt-field circuit. The combined regulator and electromagnetic cutout is located on the generator, also the ignition coil and ignition head, as shown in Fig. 685. The ignition system is of the insulated type. It is controlled by the combination ignition and lighting switch mounted on the dash. The ignition switch reverses the direction of the current through the breaker contact points each time the ignition is used, and in this way increases their life. Two sets of headlights are used. The installation on the Velie is clearly shown in Fig. 693.

How One Dealer's Wife Helps Sell Cars

Pekin, Ill., Feb. 28—The wife of a motor car dealer here is aiding him to build up the largest business in passenger cars in that vicinity. She makes up a list of prospects among the women and invites them to a card party and luncheon in the showroom. One section is reserved for these

events and the guests are given hospitable treatment by the hostess. The room contains, in addition to the card tables, the working model of the car distributed, and the feminine visitors are naturally inquisitive about the operation of the engine, gears, etc., and the hostess good naturedly

explains each detail and wins the attention. The result is that surprisingly many of the prospects eventually induce their husbands or fathers to invest in a car. The sight of a score or more of attractively dressed ladies calling at the garage, is also an effective advertisement.

The Readers' Clearing House

Questions and Answers

Conducted by B. M. Ikert

Speaking Tube Dead

Q—What kind of transmitter could be used on a speaking tube of $\frac{1}{4}$ -in. pipe, 100 ft. long? I have one in the garage, but the sound seems dead.—Jesse Messenger, Rippey, Iowa.

One-quarter inch is entirely too small for speaking tubes. The ordinary size is generally $\frac{3}{8}$ in. or 1 in. No matter what size transmitter or what style you use, the dead sound that you complain of will still be the same if this small-size pipe is used.

Cutting Down Seat Back

Q—What is the best method to cut down or hinge the back of front seat to tip back to rear seat, thereby making a full-sized bed? The car is question is a model N Hupmobile.—George F. Noisom, Battle Creek, Mich.

This has been done but the result in most cases is unsatisfactory. To cut down the corners of the front seat and hinge the back greatly weakens the construction of the body and does not possess sufficient advantage to warrant the trouble and expense of doing it.

Technical Motor Car Questions

Q—Explain method of adjustment of Jacox steering gear as used on the Oldsmobile six.

2—Explain briefly what principles of automotive engineering make it possible for two engines of different bore and stroke to develop practically the same ultimate horsepower at widely different r.p.m.

3—Allowing for proper mean effective pressure and good volumetric efficiency and fuel and carburetion, there still remains something to be explained. For example, take two six-cylinder engines; one has a bore of $2\frac{1}{8}$ and a stroke of $4\frac{1}{2}$, and the other is $3\frac{1}{2}$ by 5. By actual block test the smaller engine develops 44 hp. at 2600 r.p.m., while the larger engine develops only 46 hp. block test, at 3200 r.p.m. As I understand horsepower, it is dependent, other things being in proper adjustment, on the bore

Miscellaneous

and the number of power strokes per minute. Notice that the two engines develop about the same horsepower, although the larger one is making almost 2000 more piston strokes a minute than the smaller one. According to the same scale, the smaller engine would develop the most horsepower when at a speed of 3200 r.p.m. or equal to the larger engine in speed. Why is this?

4—Is there some good book on automotive engineering which will answer questions such as the above? If so, who publishes it?

5—What makes of engines are used in the following cars: Moon 6-36, Scripps-Booth 6-39, Grant six, Pilot six, King eight, Oldsmobile eight, Scripps-Booth eight?—Subscriber, Shreveport, La.

1—At the lower end of the nickelplated column under the engine bonnet which is encircled by a band and a pinching bolt. Just below this nut is another bolt, which passes through the top of the steering gearcase and the case is slotted so this bolt will pinch upon the thread of the nut quite firmly. By loosening this lower bolt, and also the bolt passing through the nut itself, this nut easily can be moved to the right, which will take up all wear and play in the steering gear. Leave about an inch movement of the wheel. It is wise to jack the front of the car up to determine this play as it is then done more accurately.

2—Much is dependent on the horsepower of an engine. Valve location, manifold design, engine speed and cylinder bore, all these influence the power of the engine. One engine of T-head design with an old-type manifold, large bore and slow speed will develop perhaps the same power as a

smaller engine of much smaller bore but running at a higher speed and having more favored manifold design.

3—The only reason for these apparently contradictory statements are the dates of the engine designs. Speed and bore are the most important factors in producing power. High speed and small bore go hand in hand, and these types were applied to the motor car. If the larger engine in this comparison of yours is of older design than the smaller engine, and both operating upon the fuel we contend with now, then the smaller engine very easily could show a superiority in power.

4—The "Gasoline Automobile," by P. M. Heldt, Nyack, N. Y., is a very good book on automotive engineering.

5—See the Jan. 23 issue of MOTOR AGE for this data.

Use of Calcium Chloride

Q—Where can I obtain an instrument to test the gravity or density of a calcium chloride mixture so I may know the freezing point? I am using 1 lb. of calcium chloride to every gallon of water and about 1 oz. of boracic acid to neutralize the salts. Is this mixture too strong? Would it harm the radiator and connections? What would the freezing point be?—A. C. Moeller, Aurora, Ill.

MOTOR AGE knows of no such instrument, although it may be possible some readers have used some of the instruments employed by physicians for determining the specific gravity of various liquids. Such instruments are calibrated to read higher and lower than most instruments, but to use probably some experimenting would be necessary to know just what the readings

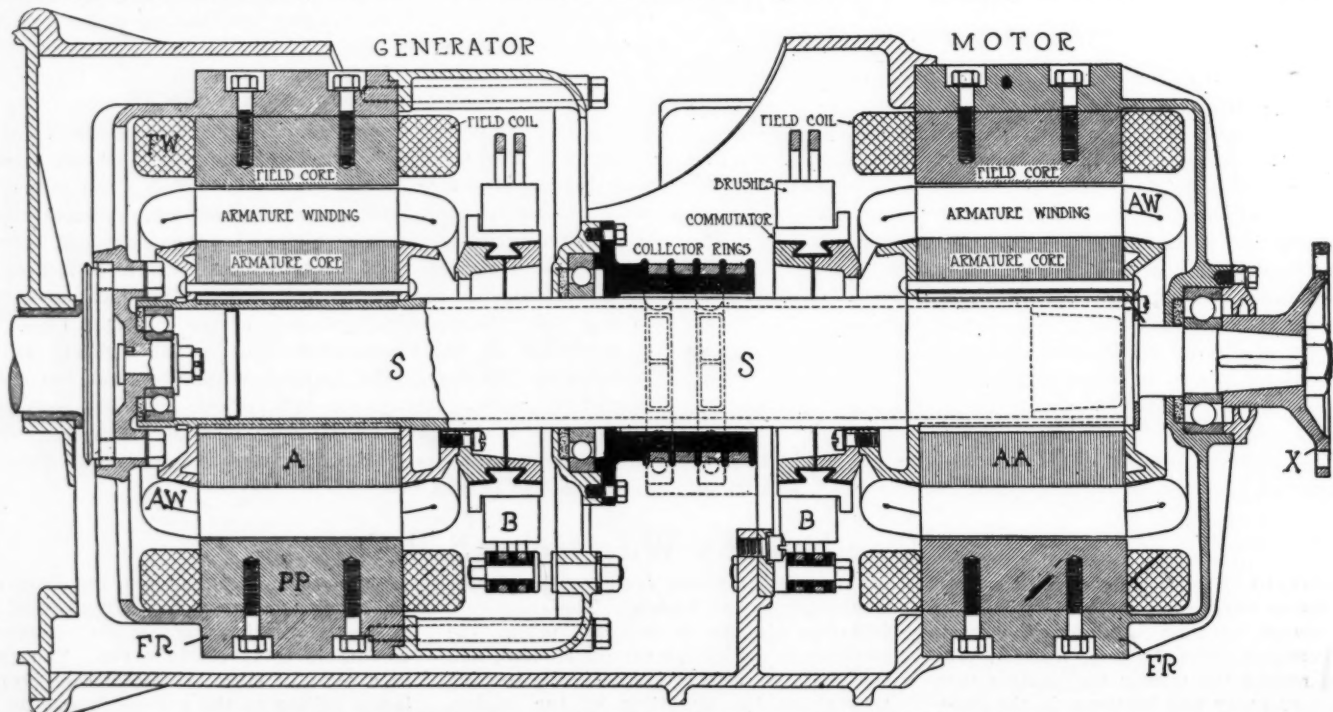


Fig. 1—Diagrammatic illustration of the two fields and two armatures of the Owen-Magnetic

would mean in connection with a solution of calcium chloride.

It is doubtful if boracic acid will neutralize the salts in calcium chloride, for it is rather too mild. It will depend upon what temperature you wish to provide against in making a proportion of calcium chloride and water. About $3\frac{1}{4}$ lb. to a gallon of water is the correct proportion for zero weather and 4 lb. to the gallon for 17 below.

You may make up your mind to one thing, calcium chloride is more liable to play havoc with the radiator and some other parts, for it will attack almost anything but cast iron. The subject of anti-freezing was taken up thoroughly in *MOTOR AGE* Nov. 7, and in a later issue the use of oil was treated. Kerosene oil is good under certain conditions but must be used with care and be watched. Those who have used properly some of the prepared anti-freezing compounds have been entirely satisfied and have had no trouble when the directions of the makers were followed.

Principle of Owen-Magnetic

Q—What is the principle of the Owen-Magnetic transmission?—W. E. Thragmorton, Ingram, Ark.

The Owen-Magnetic makes use of an actual electric transmission known as the Entz. The arrangement of this system permits the changing of all speeds by a small lever similar to a spark lever mounted on the steering wheels. As will be noted in Fig. 1 there is a generator, the field magnet of which is attached to the engine crankshaft and which takes the place of a flywheel. The armature is connected with the driveshaft. This transmits the power of the engine by the current established in its circuit which is due to the speed difference on what would be termed high speed.

The clutch generator member makes an elastic clutching and transmitting means, but more than the full torque of the engine cannot be transmitted. For a greater torque an electric motor is used, the armature of which is mounted on the driveshaft and receives its current from clutch generator. The clutch generator is shown at the left in Fig. 1, FR representing the field, FW the field winding and PP the pole pieces. This portion revolves with the crankshaft. Within this portion is the armature which is secured to the continuous shaft S and connected to the driveshaft at the coupling X.

At the right is the second part of the system, practically a duplicate of the first. Its armature AA is carried on the same shaft as armature A. Outside this is the usual field part with rings FR and windings FW, pole pieces and brushes B. Fields FR may revolve without any motion of A. The several different speeds are obtained by varying the relative speeds of FR and A. On direct drive the armature is short-circuited on itself, and the armature A is carried with it. With the exception of a slippage of 1 to 4 per cent between the field and the armature the driveshaft would be driven the same revolutions per minute as the armature.

The explanation just given may not be easily understood because of its technical nature and for that reason a simple explanation may be better. Refer to Fig. 2.

A—Ordinary type of keeper.

To assist readers in obtaining as a unit all information contained in this department on a certain subject *MOTOR AGE* segregates inquiries into divisions of allied nature. Questions pertaining to engines are answered under that head, and so on.

Jesse Messenger.....Rippey, Iowa
George F. Nolsom...Battle Creek, Mich.
Subscriber.....Shreveport, La.
A. C. Moeller.....Aurora, Ill.
W. E. Thragmorton.....Ingram, Ark.
V. L. M.....Bottineau, N. D.

ENGINES

F. H. Qualman.....Milwaukee, Wis.
Frank Keuhn.....Arlington, S. D.
O. K. Newby.....Kansas City, Mo.

CARBURETION

Subscriber.....Shreveport, La.
R. S. Chamberlain.....Romero, Tex.
George F. Nolsom...Battle Creek, Mich.
T. L. Joseph.....Hopkinton, Iowa

THE ELECTRIC SYSTEM

S. Shimoda.....Seattle, Wash.
Roy Carpenter.....Walla Walla, Wash.
Clarence Ike.....Spring Grove, Minn.
Rev. B. Halle.....Lukachukai, Ariz.
A. W. Turpin.....Molson, Wash.
Subscriber.....Avilla, Ind.
T. Jensen & Brothers.....Marion, Kan.
Otto Delfs.....Inman, Kan.
S. M. Rothfuss.....Blissfield, Mich.
H. I. Blomgren.....Wausa, Neb.
Subscriber.....Dubuque, Iowa
W. F. Dewey.....Sauk Rapids, Minn.
Reader.....Lostant, Ill.
Edwin Maxwell.....Palmyra, Ill.
George Kraus.....Mogolion, N. M.
A. C. Gunderson.....Newell, S. D.

B—Magnet on pedestal with hand crank to revolve it.

C—Piece of round steel placed within magnet on same line of travel. It is apparent that by turning the crank, the magnet will revolve and the attraction of the magnet B to the bar C will cause C to revolve with it.

Instead of B being now revolved by a hand crank it is revolved by a gasoline engine and B taking the place of a flywheel revolves at engine crankshaft speed regulated by a throttle. B is a revolving field, C part of the propeller shaft and let C be referred to as an armature. When the car is running in high speed C, being attracted, follows B because it is magnetically locked. There is no mechanical connection between the rear axle and engine, magnetism alone transmitting the power. With this magnetic attraction between the two at its highest point the drive practically is locked. Consequently, when operating in this almost direct drive, extreme difficulty may be realized in climbing steep grades or pulling heavy loads. To overcome this a speed reduction has been provided so, by reducing the magnetism between the first and second part, the engine crankshaft revolves faster than the driveshaft. The ratio between the two depends upon the amount of reduction in the magnetism.

In effect we are now driving through what may appropriately be termed a slipping clutch in the gear transmission car. When C and B cease to be magnetically locked it is evident B will revolve faster

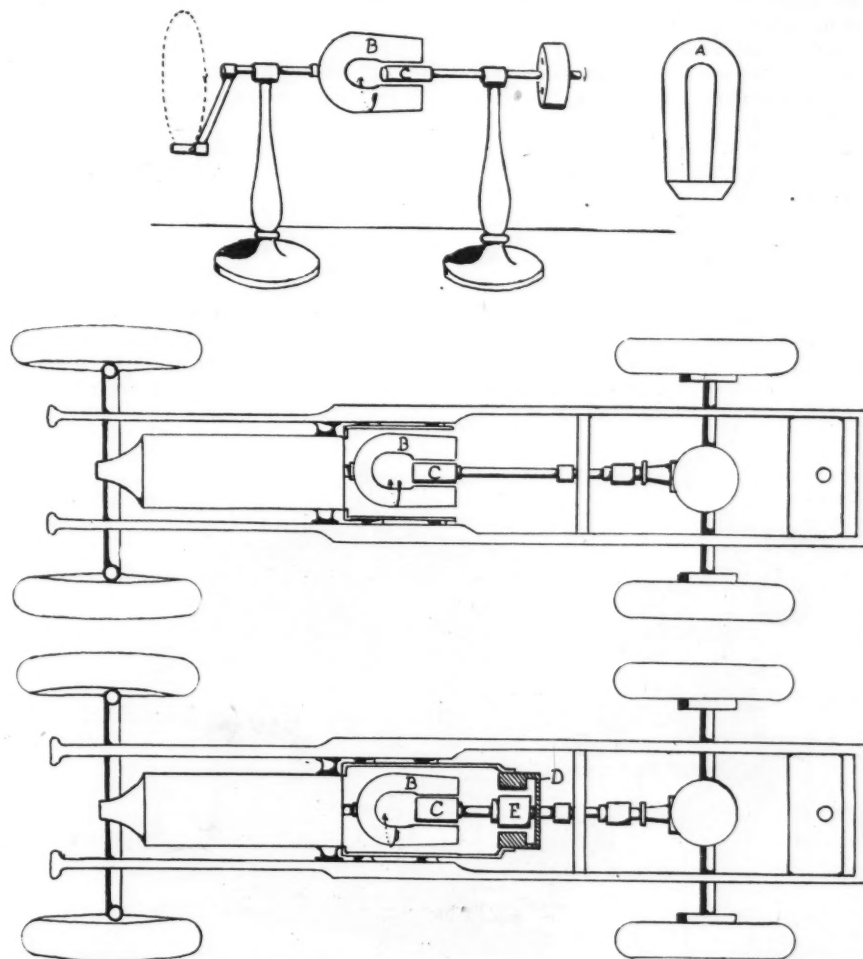


Fig. 2—The fundamental principles used in the Owen-Magnetic, top; theory of the electric transmission applied to the car, center; and conventional motor D applied to driveshaft

than C. In so doing electricity is generated and led to D. Armature E, which is the same as C and mounted on the same propeller shaft, takes the electricity generated by the slip and acts as a power booster of the propeller shaft which makes a greater number of speed reductions possible.

Noise In Mitchell Gearset

Q—My 1915 Mitchell has a grinding noise when in intermediate. What causes this?
2—Give diagram and directions to tighten steering wheel.—V. L. M., Bottineau, N. D.

1—Under ordinary circumstances there is nothing alarming about this, for it is by no means an unusual condition, particularly where there is a heavy pull. There is the possibility that one or both of the bearings supporting the main transmission shaft—or those on the countershaft—have become worn and permit the shaft to be out of alignment. This can be told only by taking down the transmission. The transmission is shown in Fig. 3. To remove the transmission place a jack under the jackshaft housing to prevent the transmission from falling.

Remove and slide back the shell covering the clutch hub, then turn the clutch until one slot in the clutch hub is up and the other down. Remove the two large hexagon nuts holding the transmission to the main cross frame member. By lowering the jack the front of the transmission can be lowered to the floor. Remove the eight bolts holding the transmission to the drive shaft housing and the transmission can be removed. After the transmission has been taken out of the car the square mainshaft B with the bearing L can be drawn from the gearcase without disturbing any other part. After the top cover plate M is removed the two sliding gears A and J can be lifted out of the case. In drawing out the square main shaft care should be taken that the thrust ball N does not drop into the case. A good suggestion is to rest the gearcase on the forward end.

To remove the gear and spindle D and I, remove the small plate in the front side of the transmission case and through this opening unscrew the collar O. The gear and spindle with universal joint complete now can be withdrawn. When putting

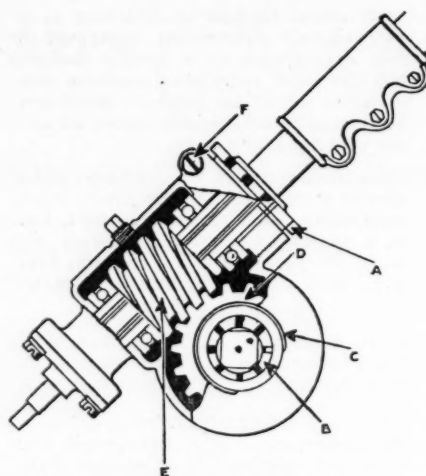


Fig. 4—Sectional view of Mitchell steering gear, showing adjustments

back this part be sure the ball thrust N is put back in place.

After the main shaft and the two sliding gears have been removed as above, take out the gearshifting rods P; remove the reverse idler gear C by tapping out from the inside of the case the short shaft upon which the gear revolves. Do not attempt to tap inward; this must be tapped outward from the inside. Remove the two bearing caps R and R and move back the sub-shaft F until the bearing S comes from the case. To remove the bearing S from the shaft lift up the front end of the sub-shaft and it can be taken out through the top of the case. To remove gears from sub-shaft, an arbor press should be used. Do not attempt to drive them off; if you do so, there is danger of bending or upsetting the ends of the shaft.

2—The Mitchell steering gear is shown in Fig. 4. To adjust for end play do so by turning the adjusting collar A, which is held in place by the pinch bolt F. To adjust the mesh of the worm and gear it is necessary to remove the clamp plate holding the steering gear to the frame and move it up far enough to make it accessible. Take out the spring retainer C and turn the eccentric bushing B until the proper mesh is obtained. If after the gears have become worn after long usage to such

an extent that the adjustments will not prove satisfactory, the gear D can be turned a half revolution. This will place the unworn part of the gear in mesh with the worm E, saving the expense of renewing the complete gear. When making this change it will be necessary to put a new notch in the corner which becomes the top so that the pinch bolt of the steering arm can be installed.

Engines

Horsepower Rating

Q—Publish formula for figuring the horsepower of an engine, N. A. C. C. rating.—F. H. Qualman, Milwaukee, Wis.

$$D^2 \times N$$

The formula is $\frac{D^2 \times N}{2.5}$ where

D equals bore
N is number of cylinders
2.5 is a constant.

Balancing Ford Crankshaft

Q—Explain fully how to balance a Ford crankshaft.

2—Explain how to test a Ford crankshaft for proper balance when using Dunn counterbalance.

3—Explain how to balance a Ford flywheel.

4—Can this be done by attaching it to a properly balanced counterbalanced crankshaft?

5—Illustrate method to use in attaching quarter-elliptic springs similar to those used on Saxon cars.

6—Illustrate method of lowering the rear spring of a Ford.

7—Would it be best to place the spring in front of the rear axle or should one place it behind the axle?—Frank Kuehn, Arlington, S. D.

1-2-3-4—Assuming you have dismantled the engine so the crankshaft is entirely free, the next step is to get the proper tools and equipment to do the balancing.

A balancing stand, such as is used for the balancing of electric motors and generator armatures should be obtained. If impossible to obtain, a stand can be made as follows: Procure two round steel bars, $1\frac{1}{2}$ to 2 in. in diameter and about $2\frac{1}{2}$ ft. in length. These are placed on four 12-in. blocks, two blocks for each bar, and leveled up after they have been set the proper distance apart. These bars should possess a perfectly smooth surface, and a steel level should be used in the operation of trueing them up. It is necessary that the bars are so secured to the blocks that they cannot roll or get out of place.

Place the counterbalances on the crankshaft according to the directions of the manufacturer. When they are tightened and the nuts are locked with cotter pins place the crankshaft on the bars so the front and rear main bearing journals will support it. By slightly tapping the crankshaft with the hand it will roll along the bars and stop at a certain point each time. With chalk mark this point of the counterbalance at the bottom, which represents the side which is over-weight. With a $\frac{1}{2}$ -in. drill start a hole at the chalk mark but drill gradually, each time placing the shaft on the bars to determine its state of balance. The crankshaft is properly balanced when by gently rolling it along the bars it fails to come to a stop at any certain position.

When this is done bolt the flywheel and transmission to the crankshaft, after which test the balance as was done in the first instance. This time, whatever material is to be removed must be removed from the flywheel. The rim of the flywheel will expose

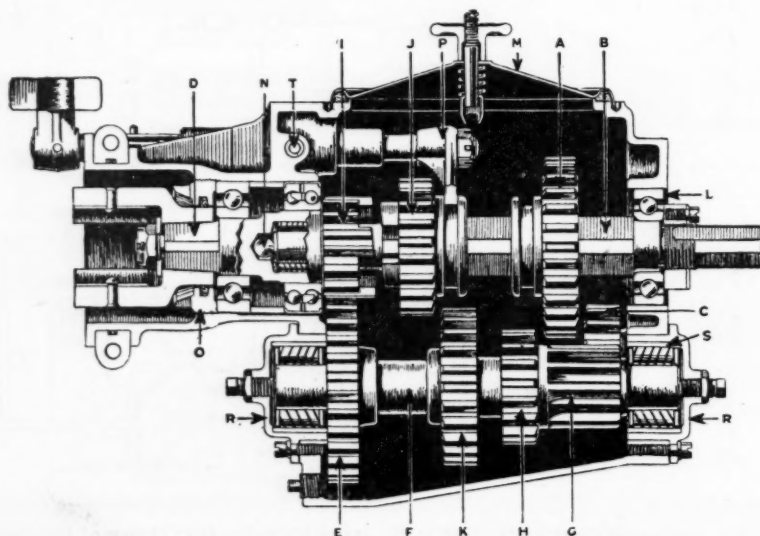


Fig. 3—Mitchell transmission showing locations of gears, forks, etc.

the original balancing and whatever material is to be taken off should be in the same line of circumference. When, after repeated tests, the flywheel and crankshaft combined show they are perfectly balanced, the engine is ready to be re-assembled, but if an extra good job is wanted the connecting rods and pistons should be removed and balanced.

5—Attaching quarter elliptic springs is quite an easy matter and really requires no illustration. Here is one way of doing it. Make a bracket from a piece of angle iron about 3 by 3 by 6 in. and rivet one side of this to the frame side member. It should be attached so the extending side of the bracket is at the bottom. Place the end of the spring on the bracket and with an awl scratch the lines marking the width of the spring. Next drill four holes for the spring clips which will fit over the springs, with their lugs extending through the holes in the angle iron, where the nuts are applied. Another simple way is to place the springs directly under the frame side members and attach them with very long clips or U-bolts. This, however, does not let you place the frame as low as the other way.

6—This was shown in the issue of Feb. 27.

7—In this case the spring has been placed behind the axle, thus giving a slightly longer wheelbase.

Counterbalancing Crankshaft

Q—What is the correct way of ascertaining the proper amount of counterbalance for a crankshaft of a four-cylinder engine? On this particular engine I have an extra shaft which I could bisect if necessary.

2—What is the fastest timing of the intake and exhaust valves, or does this vary with the stroke? If so, this engine is 2 1/4 by 3, high-speed, L-head intake over exhaust.—O. K. Newby, Kansas City, Mo.

1—You do not state the location of the bearings in your crankshaft, but it is assumed that the shaft is similar to the one in Fig. 5. The centrifugal force of the revolving weight of the shaft tends to throw the bearings out of position, as is indicated by the dotted lines. These forces can be counterbalanced, in part only, by attaching weights at the positions shown. The calculation of the size of these weights is a long process. The lower half of the connecting rod must be considered as part of the weight to be counterbalanced. The other weights are one web of the crankshaft and half of the weight of the rod bearing. The value of these forces are calculated from the formula:

$$\text{Force (in pounds)} = \frac{W \times V^2}{32.2 \times R}$$

where W is the weight of the revolving mass in pounds.

V is the velocity of the mass in feet per second.

R is the radius from the center of gravity to the center of revolution.

There are many other things to consider. The weights do not all revolve in the same plane, neither at the same distance from the center of revolution. The immensity of the job and the probable cost to fix the weights to the shaft after they are made would render the undertaking prohibitive. So we advise that you had better get a new shaft made by some reputable manufacturer of counterbalanced shafts.

2—A good valve timing for very high-speed engine work is:

Inlet opens T. D. C., closes 50 deg. after B. D. C.

Exhaust opens 50 deg. before B. D. C. and closes 10 deg. after T. D. C.

Carburetion

Johnson Carburetor

Q—Has the Johnson type of compensating carburetor, as used on the Apperson, Premier and other cars, any special advantages in burning the low-grade fuel of the day? When set for economical performance at moderate speeds, will it give a good mixture at high speeds?—Subscriber, Shreveport, La.

The Johnson carburetor has a sleeve that slides up and down in accordance with the demand and so regulates the quantity of air admitted. The burning of fuel in an engine is taken care of more readily regardless of the type of carburetor if the proper application of heat is made to the fuel. The Apperson and Premier engineers have devoted considerable study to this subject and have turned out a highly satisfactory manifold. It is claimed the compensating sleeve on the Johnson carburetor automatically controls the fuel and air supply at all speeds.

The shifter valve E performs two functions in one position. It serves for starting purposes, using gasoline as fuel, at the same time closing off communication between the vapor tube and the mixing chamber. Practically, it is a two-way valve.

Gasoline for starting is supplied from an auxiliary tank connected at G on the shifter valve housing, passing through the valve to the venturi tube, where it heats the air induced by suction of the engine in its passage into the intake manifold.

Carburetion Questions

Q—What is the ram's horn and hot spot on the Chalmers motor car?

2—Can I get a coal oil carburetor for a Briscoe 4-24 car?

3—Where can I get some nickel-plated or enameled disks about 20 in. in diameter?

4—Where can I get some spring covers?

5—My 1917 Briscoe has plenty power, will spin wheels in all gears, but it is hard to start. Plugs are clean and the car seems in good condition. The water boils much too easily. In running on high the clutch slips. When running slow in low with a heavy pull there is a metallic sound. This is not present when running 18 m.p.h. and up on high. It occurs only in low and on a hard pull. What causes this and what is the remedy?—R. S. Chamberlain, Romero, Tex.

1—The hot spot is a portion of the intake manifold heated by the exhaust gases as they emerge from the cylinder. The gases leaving the carburetor are not in a perfectly carbureted form because of the poor grades of fuel now being used. So the particles of gasoline having the greater inertia are hurled abruptly against this hot spot, where they are broken up and then, joining the air, united into a perfect mixture of air and gas.

This is the theory of the hot spot. The Chalmers ram's horn manifold is a manifold designed with certain curious bends and twists that, it is claimed, offer the gases a path of the same length to every cylinder.

2—Kerosene carburetors are made by the Wilcox Bennet Co., 1030 Marshall st., Minneapolis, Minn.; Turner Brass Works, Sycamore, Ill.; Tillotson Mfg. Co., Toledo, Ohio, etc. The price varies from \$10 up.

3—Any metal specialties dealer.

4—If you mean slip covers such as are used over the seats of cars, they are made by the Atlas Specialty Mfg. Co., 22 East Twenty-fourth street, Chicago; J. P. Gordan Co., 303 North Fourth street, Columbus, Ohio, etc.

5—An engine may be hard to start for various reasons. The distributor points may be dirty and there may be no compression, caused by poor condition of valves and piston rings. The carburetor may be functioning properly. To remedy this condition it might be advisable to have the car overhauled if you are not familiar with the details yourself.

Holley Vaporizer Operation

Q—Give sectional view and explanation of the working of the Holley kerosene carburetor as used on the Fordson tractor?—T. L. Joseph, Hopkinton, Iowa.

The Holley kerosene carburetor properly vaporizes kerosene and permits a correct mixture of air to make it combustible. The chief feature is that the heat is shunted in such a manner as to permit the use of different grades of fuel under different temperatures, and a thin-walled brass tube is used for vaporizing the fuel. The rapid flow of heat through and around this thin tube makes it possible to use one float chamber and to shift from gasoline to kerosene in less than a minute. By consulting Fig. 7 the details may be observed. The gasoline for starting is admitted by a mixing valve, or jet, which is in operation for only a short time and which resembles the choke tube used on ordinary carburetors for starting. The kerosene enters the float-chamber at 22 and is controlled as in any ordinary float carburetor. From the float-chamber the fuel passes through an orifice controlled by a needle valve to the top of the jet, where it is atomized by about 10 per cent of the total air required for combustion. This is accomplished through an ordinary spray nozzle. The mixture of atomized fuel and air is drawn through the vapor tube A, located in the heater chamber of the exhaust manifold B, where the fuel is vaporized in its passage through the coil tube T T. This relatively rich mixture is heated progressively higher in temperature in its passage through the vapor tube and by applying the heat at

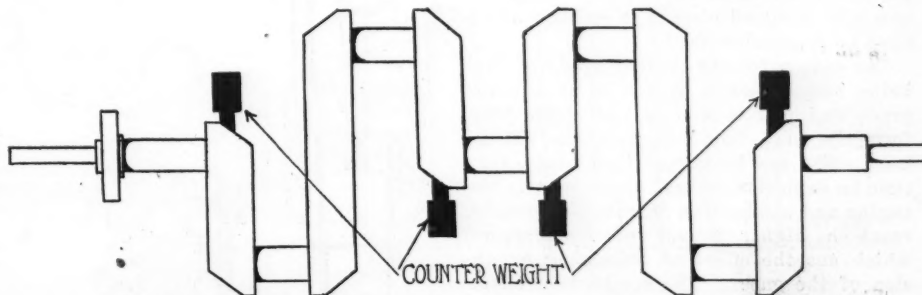


Fig. 5—Typical counterbalanced crankshaft, showing counterweights

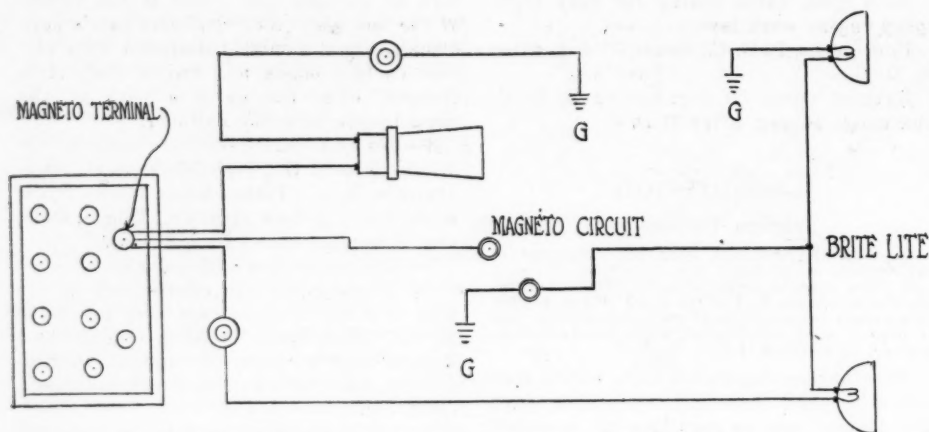


Fig. 6—Wiring diagram showing connection of Brite-Lite on Ford cars

progressive stages, deposits due to decomposition of products are said to be avoided. The temperature of the rich vapor can be regulated by the shunt valve C, controlled by the lever D, whereby more or less of the hot exhaust gases can be caused to come into direct contact with the vapor tube, thereby compensating for variations in fuel or operating conditions. From the heater chamber the vapor tube issues and is connected through the shifter valve E to the venturi tube in the mixing chamber F.

At the venturi tube the rich vapor is diluted with the additional relatively cold air required to form a combustible mixture. Here the action is similar to that in any carbureter, except that instead of gasoline and air being mixed a relatively rich mixture of fuel, plus 10 per cent of the necessary air, is admitted in place of the fuel alone and in addition 90 per cent of the air required is supplied. The additional air required is admitted through a special form of air valve, which governs the air admitted in accordance with the throttle position and requirements of the engine.

High Compression Knock

Q—Is there such a thing as high compression resulting in a very bad knock similar to a carbon knock? In other words, barring carbon and ignition or timing trouble, what would be the cause of a very bad rasping knock in an engine under but a slight pull?—George F. Nolsom, Battle Creek, Mich.

Yes, there is such a thing as a knock resulting from high compression. Two very distinct reasons are accountable for this trouble. One is that not enough combustion space has been allowed in the cylinder head, and the other reason can be directly accounted for in the present heavy fuel. The remedy for this may lie in increasing the capacity of the combustion chamber, which in most cases must be accomplished by using a heavier cylinder head gasket in the removable-head type or by installing specially-designed pistons in engines which have no removable head.

The reason for the present grade of fuel being responsible is that it is of a lower grade and possesses more heat units than formerly were found in gasoline. These heat units are converted into heat every time an explosion occurs. Consequently the engine and combustion chamber, especially, reach a higher degree of temperature, which has the effect of increasing expansion of the gases. The combustion chambers of the old engines were not constructed to overcome this feature because of the

better grade of fuel in use at the time of their manufacture.

The Electric System

Wiring of Overland 81

Q—Give wiring diagram for Overland, model 81.—Fulton & Felix, Dallas, Tex.

This diagram is shown in Fig. 8.

Using Lincoln Battery Charger

Q—Publish diagram for generator and switch board of Lincoln battery charger. This is D. C. 88, 110-volt, 50.7-amp. How can I connect the resistance if I want recharge for three-cell battery for this machine?—S. Shimoda, Seattle, Wash.

To recharge a three-cell battery a double-pole, double-throw switch should be put in the circuit. One end of the switch should be connected to the leads which go to the car. The central points should be connected to the rheostat and three-cell battery circuit as shown in diagram.

To charge a three-cell battery, first start up the motor-generator set by throwing switch in points leading from plug at car as in ordinarily starting up the set. When set has come up to speed and has been thrown over onto the A. C. supply, then throw switch over to side with rheostat and battery circuit. This will take care of charging a small battery.

Blitz Ignition for Ford

Q—I have mounted a Bosch distributor on a Blitz ignition drive on a Ford car, but I am unable to wire up the coil properly. Show the correct diagram of this. I can use a 6-volt current from the battery and I have a Gray & Davis installed.

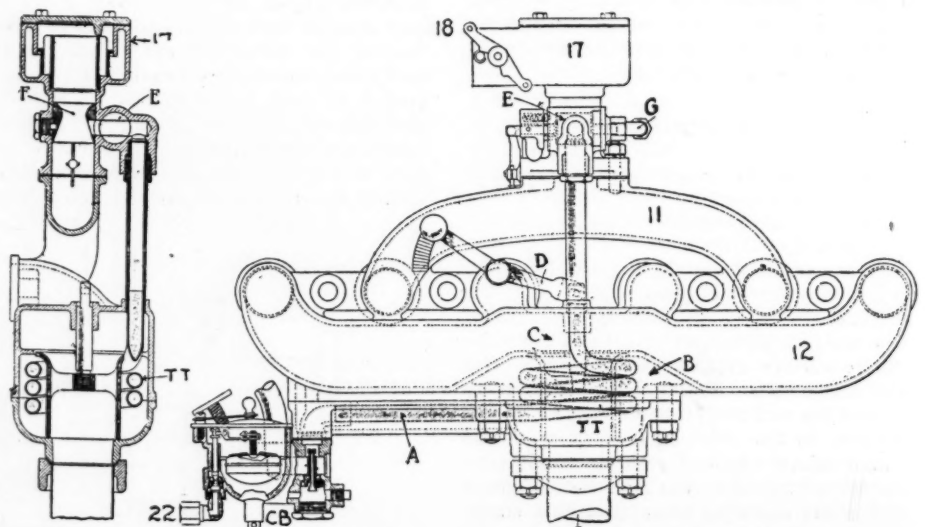


Fig. 7—Cross-section of Holley vaporizer, showing method of operation

2—Is it possible to use regular magneto current if a vibrator is used or Delco relay or some such apparatus?—Clarence Ike, Spring Grove, Minn.

1—The only information we have concerning the Blitz ignition drive for Fords is an article published in MOTOR AGE May 7, 1914. This system uses one of the coils of the Ford, allowing it to act for all four. Take the wire from the high side of the coil and run it to the center of the distributor arm, and then the ignition wires will run to the cylinders and the consecutive order of the wires around the periphery of the distributor to the cylinders should be 1-3-4-2.

2—The system is designed to run on one of the Ford coils from the Ford magneto.

Wiring of Brite-Lite

Q—My 1912 Ford is equipped with a Dixie magneto using Ford magneto for lights. Brite-Lite regulator has been added, which the garage-man insisted on wiring as in later Ford models by grounding the headlights to the frame. This gives poor satisfaction. Does this equalizer act as a ground?

2—Publish wiring diagram for headlights, spot and tail light to equalizer and one-point switch.—Rev. B. Haile, Lukachukai, Ariz.

1—The Brite-Lite is not an equalizer. It is merely a connection that throws all of the voltage from the Ford generator to one lamp, the right one, and puts the other out. The diagram is shown in Fig. 6.

2—The Brite-Lite shorts out the left headlight. Its use is not recommended above speeds of 20 m.p.h.

Changing Generator Polarity

Q—Will a model 90 Overland generator reverse its polarity? If so, what can I do to change it back? The one I have shows a direct short-circuit by the ammeter or a charge in the wrong direction. I cannot tell which. Everything about the system seems to be in good shape with this exception. If I close the relay points while the engine is standing still, they stick together and will not open unless forced and the ammeter shows a complete discharge.—A. W. Turpin, Molson, Wash.

The charging generator on the Overland 90 should have its negative terminal grounded and the positive terminal connected to the cut-out. A wiring diagram is shown in Fig. 10. The old and new types of cut-outs are shown, but their operation is practically the same. If the battery negative terminal is grounded and the positive terminal connected to one terminal of the ammeter, as shown, the following action will take place as the speed of the armature of the generator increases

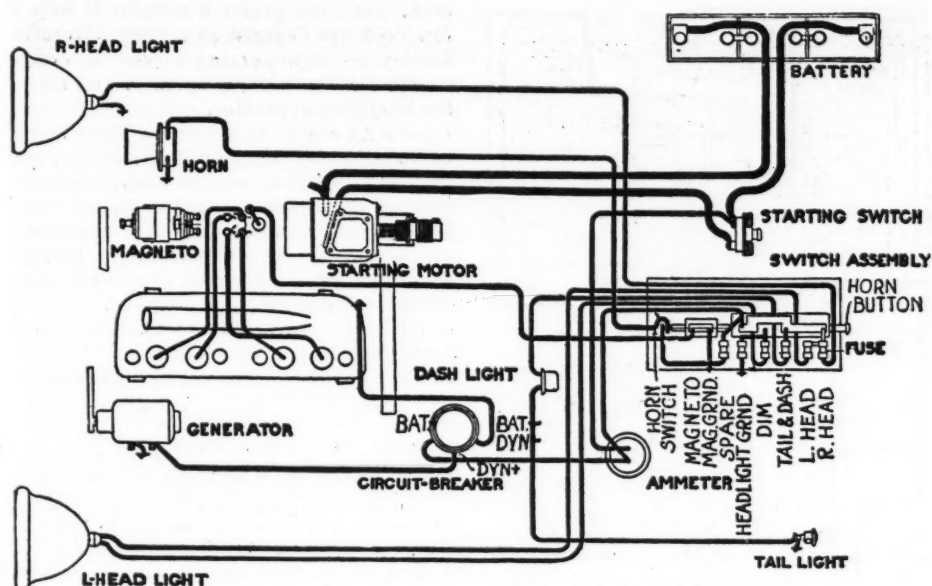


Fig. 8—Wiring diagram of the Overland model S1

due to the speed of the engine increasing. As the voltage generated in the armature winding increases there is an increase in the current produced in the fine wire winding on the cut-out. This current magnetizes the core of the cut-out, which produces a pull on the cut-out armature. This pull increases as the current in the winding increases and finally the armature is drawn up and the contacts closed. Then the positive terminal of the generator is connected to the positive terminal of the battery with the coarse wire winding on the cut-out, called the series winding, directly in series. If the generator voltage exceeds in value the battery voltage, the generator will send a current through the battery in a direction opposite to the battery voltage and the battery will charge. If, however, the battery voltage happens to exceed the generator voltage, the battery will discharge through the generator. The battery will continue to discharge until the voltage of the generator has increased to a value equal to the battery voltage or greater, or until the circuit connect-

ing the two is opened by the cut-out contacts.

The cut-out core is magnetized only while the contacts are closed when there is a current in the series winding, which also produces a magnetizing action on the core. The magnetizing action of the series winding may or may not assist the magnetizing action of the fine wire winding, depending on the relative directions of the currents in the two windings. When the battery is charging the current in the series winding passes around the cut-out core in the same direction as the current in the fine wire winding, while if the battery is discharging the current in the series winding passes around the core in the opposite direction. The series winding tends to keep the cut-out contacts closed while the battery is charging but tends to open them as soon as the battery discharges.

If the armature of the cut-out is shoved up toward the iron core so the contacts are closed and the generator armature is not revolving, the battery will send a heavy discharge current through the generator

and the ammeter shows discharge. This discharge current doubtless will be more than the ammeter is capable of indicating and may ruin the instrument.

When the contacts are closed, the magnetizing action of the series turns exceeds the magnetizing action of the fine wire turns and the contact remains closed until the discharge current from the battery has decreased to a value incapable of producing sufficient magnetizing action to hold the contact closed, unless the circuit is opened or the armature is forced away from the core.

You should check the connections of your systems, and the polarity of the generator and battery should agree with those given. The negative terminals should be grounded, and this may be determined with a voltmeter. Run the engine at a slow speed so the cut-out does not close and determine the polarity of the generator. If the polarities are all correct and your ammeter still indicates a discharge with the cut-out contacts closed and the generator voltage is greater than the battery voltage before they close, then the connections to the ammeter are reversed.

If the polarity of the generator is reversed, it may be changed back as follows: Raise the negative brush from the commutator and slip a piece of paper under it, then close the cut-out and your ammeter should indicate a small discharge current. This current passes from the positive terminal of the battery through the series winding on the cut-out and the cut-out contacts to the positive brush of the generator through a part of the armature winding to the third brush, then through the two field coils to the negative terminal of the generator and back to the battery. If the battery is connected properly and all other connections are the same as indicated, then the current in the field winding will magnetize the field cores to their correct polarity. Allow this current to pass through the field winding for several minutes, and it might be well lightly to tap the frame of the generator, which will aid the current in reversing and re-establishing the magnetism in the cores.

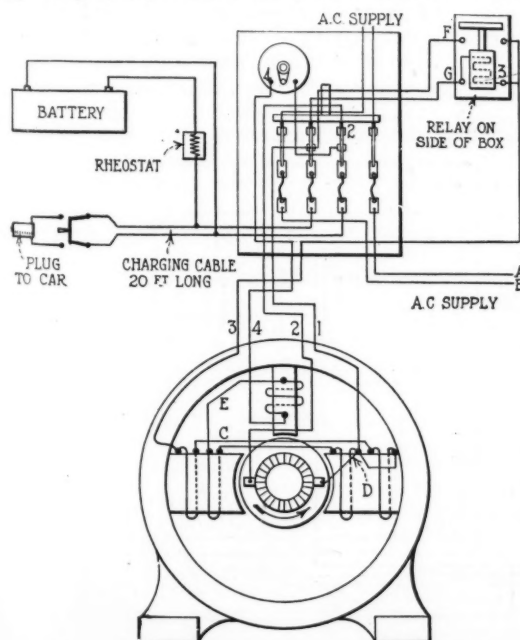


Fig. 9—Connections for Lincoln battery charger

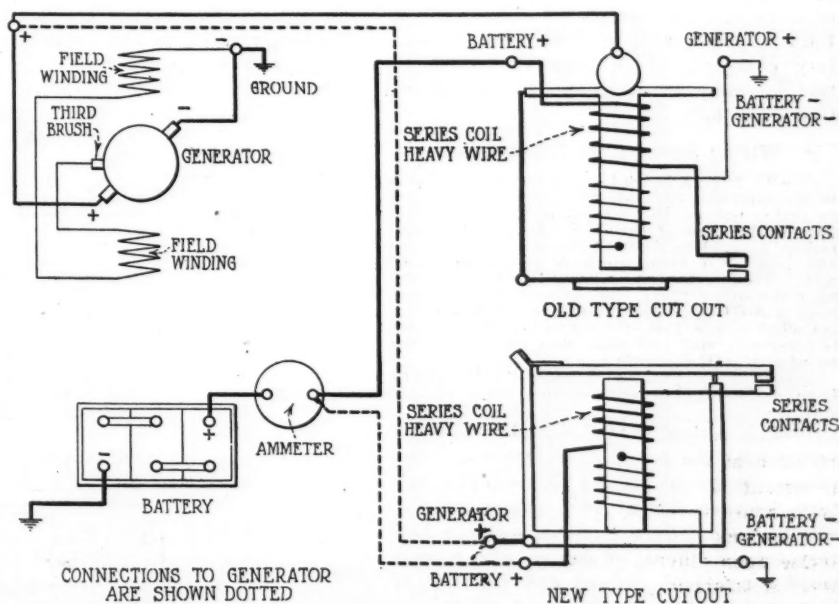


Fig. 10—Wiring diagram of model 90 Overland generator

Remove the paper from under the negative brush and test the polarity of the generator when the engine is running slow. It should now be correct. Gradually increase the speed of the engine until the cut-out closes and observe the reading of the ammeter when the contacts are closed. The adjustment of the cut-out should be such that the generator voltage is greater than the battery voltage so the battery always will start to charge as soon as the contacts on the cut-out close. The generator charging rate is adjusted by moving the third brush. Moving it in the direction of rotation increases the charging rate and in the opposite direction decreases the charging rate. Be sure your commutator is clean and the brushes make good contact with the commutator surface over the entire arc of contact.

Apperson Wiring Diagram

Q—Publish complete wiring diagram of Apperson 4-45 1913 Gray & Davis. This car has burnt two generator commutators in six months.

2—Give valve timing of this car in degrees?—Subscriber, Avilla, Ind.

1—This diagram is shown in Fig. 12. We would advise that the controller be examined and that the position of the brushes be checked up. If the brushes are not in their correct position, sparking will occur and this will burn up the commutator.

2—Intake valve opens 0 deg., or on top center.

Intake valve closes 29.25 deg. after bottom dead center.

Exhaust valve opens 29.25 deg. before bottom dead center.

Exhaust valve closes on top dead center.

Charging from Ford Magneto

Q—We have four Ford trucks equipped with high-tension Bosch magnetos which give us better ignition than the regular equipment. In using these, however, we find we have to ground the Ford magneto when not in use for lights, as it soon loses its strength. Being out after dark a good deal, this light does not give the satisfaction it should. Could we get storage batteries and use the Ford magneto for charging them and in that way get a more even light? How can we do this?—T. Jensen & Brothers, Marion, Kan.

It is peculiar that the magneto should lose its strength for no other reason than that described. Are you certain storage batteries are not used for starting and connected to the magneto terminal of the coil box? There is no rectifier as yet capable of rectifying the alternating current of the Ford magneto, making it suitable for battery charging, other than the Mathews rectifier, made by the Consolidated Utilities Corp., Chicago.

Wiring Phone from Light Plant

Q—We have a Delco-Light plant on our farm with sixteen cells and 32 volts. I took the batteries out of the telephone and connected two of the cells of the light plant to the telephone. I could talk all right, but if I hang up the receiver I still can hear the other party talk. I disconnected one wire and could still hear the other party, but when I disconnected both wires I can't hear anything. Can you tell me what causes this, that is, when the receiver is hung up you still can hear, and whether it can be worked satisfactorily?

2—Publish sketch for charging 6-volt battery from Delco-Light plant.—Otto Delfs, Inman, Kan.

1—The maker of Delco-Light does not recommend the practice of attaching telephone equipment to the Delco-Light battery, because this at once places unequal service upon different portions of the battery. A telephone, of course, uses a very small amount of current and in view of this would not have very much effect.

If the user desires to do this, however,

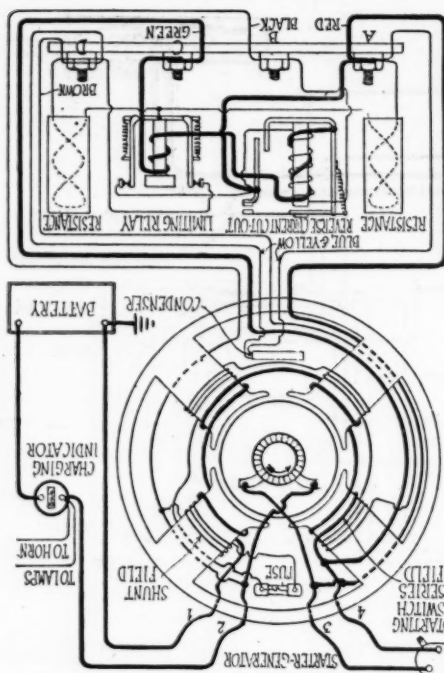


Fig. 11—Connections of North East cut-out on Dodge Brothers car

we would suggest he reverse his connections between the battery and 'phone, as it is probable polarity is causing the difficulty. The difficulty is more apt to be due to a ground upon the wiring system throughout the building. In this case it will be necessary either to eliminate the ground or to supply the energy from dry cells as in the past.

2—This was shown in MOTOR AGE for Jan. 30 on page 35.

Battery-charging Service

Q—We have 110-volt A. C. Would you advise a M. G. or mercury arc outfit?

2—We have perhaps 800 battery-using motor cars in our vicinity, of whom we have sold 150 in 1917 and 175 in 1918. Of course these later would perhaps form our foundation. There are two other stations in our city using M. G. outfits, I think, but their work is proving very unsatisfactory to the trade. What profit may we expect from charging a battery at the current rate of \$1?—S. M. Rothfuss, Blissfield, Mich.

1—Either a rectifier or a motor-generator can be used for charging ignition batteries. The latter requires less experience to op-

erate, but some prefer a rectifier if only a few cells are charged at a time. Unsatisfactory battery-charging service is nearly always the fault of the operator and not of the charging apparatus.

2—With regard to the profits there might be in charging ignition batteries for \$1, that would depend almost entirely on the number of batteries charged at one time. The cost of the electricity is a small part of the total cost. If the direct current has a voltage of 110 volts, fourteen sets of three-cell batteries of 80-amp. hr. capacity could be charged in series at a cost of 6 cents each for the electricity if the electricity is sold at 10 cents a kilowatt-hour.

Grounds on North East

Wausa, Neb., Editor Motor Age—I am, and have for some time been, under the impression that the shunt winding of the reverse current relay must be connected either to the negative wire in double-wire systems or grounded in the single-wire systems as the case may be. But in looking at the wiring diagram of the Motor Age Wiring Diagram Chart No. 6, the wiring of the model G 12-volt North East system on the 1917 Dodge Brothers car, I am unable to locate or find any ground wire leading from the starting switch and reverse current cut-out, while I have found that there has always been one attached on all the model systems that I have worked on that are supposed to be 1917 models, while in the case of this drawing it may be grounded on the iron frame of the relay and switch. But even in that case it should be indicated that it in turn should be fastened to some other iron so as to make a proper ground. Perhaps I am mistaken, in which case please advise me.—H. I. Blomgren.

Mr. Blomgren is correct in his assertion that the ground wire is not shown in the chart. The two systems are shown in Figs. 11 and 13 with the proper ground connection.

Third-brush System

Q—Explain how current regulation is accomplished by the third-brush system?

2—In your issue of Nov. 21 you show a wiring diagram of the North East system as used on Dodge Brothers cars. I note an indicator is used and that the starting current passes through this indicator. Is it possible to install an ammeter in this system. If so, show how this is done.—Subscriber, Dubuque, Iowa.

1—On account of the variable speed at which the armature is driven it is necessary to provide a means of regulating the output of the generator to obtain sufficient charge at low speed without excessive charge at high speeds. This is performed by what is known as third-brush excitation. Moving the third brush in the direction of rotation increases the charging

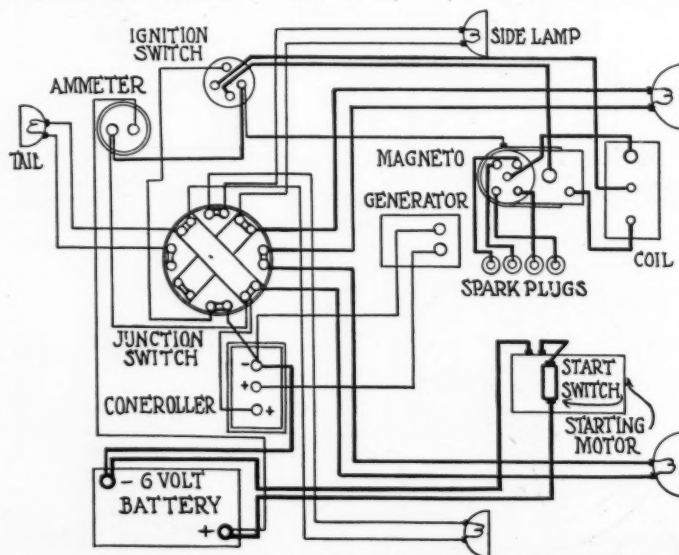


Fig. 12—Wiring diagram of Gray & Davis system on 1913 Apperson

rate, and moving it in the opposite direction decreases the rate of charge. When little or no current is flowing in the armature winding the magnetic field, produced by the field coil, is approximately straight through the armature from one pole piece to the other, as indicated by A in Fig. 14. The voltage which is generated by each armature coil is practically uniform during the time the coil is under the pole pieces.

In the generator, in which 7 volts are generated between the main brushes, it is evident that approximately 5 volts would be generated between D and the third brush E, these 5 volts being what is applied to the shunt field winding. As the charging current increases, this charging current flowing through the armature windings produces the magnetic field in the direction of the arrow B.

This distorts the magnetic field produced by the shunt field winding and, instead of the magnetism being equally distributed under the pole pieces, it is dense in the pole tips marked F and G. Thus, the armature coils no longer generate the same voltage under different parts of the pole pieces, with the result that, although the generator voltage across the main brushes remains near 7 volts, the greater part of this is generated by the coils connected to the commutator between the third brush E and the brush C, these coils being in the region of the dense field as shown by the coil P, and a small part of the total voltage is generated by the coil connected between the brushes D and E, as a greater number of these coils are in the region of the weak field as indicated by the coil O. This applies a lower voltage to the field winding, with the result that the magnetic field is weakened and the output of the generator is decreased.

2—You will not be able to install an ammeter on this system.

Starter Cuts Off Current

Q—I have a Chevrolet Baby Grand, 1916, with an Auto-Lite system, which is in good condition with the exception that when the starting motor is used it shuts off the spark and the headlights are cut off altogether. The generator shows a good charge and the starting motor works fine. All flow of electricity is cut off at the depression of the starting switch.—W. F. Dewey, Sauk Rapids, Minn.

This simmers right down to the fact that the trouble lies in the starting motor, the starting motor switch or the wires in this circuit, for the trouble develops only when the switch is used and the starting motor operates. Whatever may be the cause, it is evident the starting motor is drawing

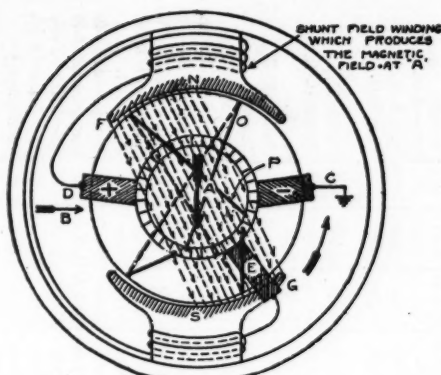


Fig. 14—Diagram illustrating operation of third brush

too much current, and it would seem as if there must be a short somewhere—in the starting motor, the switch or the wires—for otherwise all the current could not be drawn away from the lights.

Look first to the wiring system to see there is no break in the wires or no place where there is an abrasion to cause a short. Then examine the starting switch and if this is found all right, the trouble is probably a short in the starting motor itself.

Removing the Armature

Q—I want to take out the armature of a Remy generator on a 1917 Velle to turn down the commutator on a lathe. How shall I do it?
2—The bearings on my front axle fit loosely on the spindles and turn on them. Should they? If not, what is the best way to keep them from turning?—Reader, Lottant, Ill.

1—Remove the ignition head by taking out the set screws just below the head. Take out the six screws around the distributor gear housing. Next remove the regulator by taking out the four screws in the corners and removing the wires, being careful to remember where they belong. Take off the bearing cap by taking out the four small screws. Then take off the nut on the end of the armature shaft. The armature will then slip out.

2—This very subject was thoroughly treated in MOTOR AGE Jan. 2 and gave as a remedy the fitting of a bushing on the spindle. Center punching will do no good and will only throw the bearing out of true. The inside race ought not turn readily, but it is better not to have it so tight it cannot be turned by hand. This is to provide so it can turn on the spindle should something lodge in the bearing, tending to hold it from rotating.

It is not possible to install an ammeter on your Hupmobile, unless you should care to have one that will read up to 40 amp.

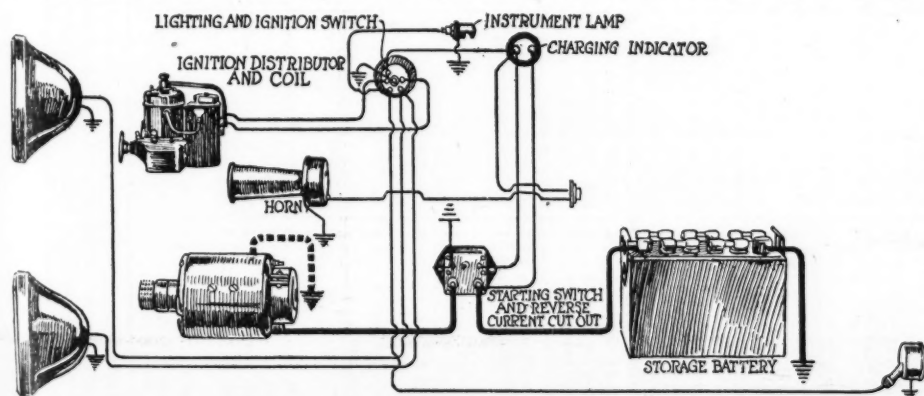


Fig. 13—Wiring diagram of model C 12-volt North East system on 1917 Dodge Brothers car

to take care of the discharge of the battery while starting the engine. If such an ammeter were installed, it would be worth nothing because the range desired will not exceed 20 amp. and this cannot be read accurately on a meter reading up to 40 amp. Two ammeters might be installed, but the difficulty and the bother that this would create would render it a nuisance. One meter would register the charge current and the other would register the discharge current. The difference of the readings would be the rate of current charge or discharge.

Generator Charges Intermittently

Q—I have a 1918 model 34 Oakland. The generator will show charge by the ammeter for a while when the car is started, then it will not. Upon looking at the circuit breaker I find that it separates and of course will not charge. If I close them, the ammeter will show discharge just as though the engine were not running, and when I close them it will charge for a while. Connections are all tight and battery will start the engine. What is the trouble?—Edwin Maxwell, Palmyra, Ill.

Your trouble lies in the fact that the gap in the circuit breaker is too wide. An examination of the brushes will also be advisable to see that they are working properly. The adjusting screw for the circuit breaker will be found to be soldered to the arm, so it will be necessary to loosen this solder to make an adjustment. The gap should be adjusted to have about 1/8 in. opening. Then it will be necessary to again solder the adjusting screw to hold it in place. Before soldering it, however, try running the engine to see if the trouble has been remedied.

Batteries with Glass Jars

Q—Is there a storage battery manufactured using glass for cells instead of rubber jars?
2—Three cells on my Willard storage battery are dead. Nos. 1, 3 and 6 have been charging and discharging with a Westinghouse 8-amp. rectifier for six days but I cannot raise the specific gravity in the three cells. The specific gravity is down to zero. What is wrong?—George Kraus, Mogollon, N. M.

1—Such storage batteries are manufactured but not for motor cars. They are made by the Electric Storage Battery Co., Allegheny avenue and Nineteenth street, Philadelphia, Pa., and the Gould Storage Battery Co., 30 East Forty-second street, New York.

2—These cells are either sulphated, have buckled plates or there is an accumulation of sediment at the bottom. The wood insulators might be in a poor condition. We would advise taking the battery to a service station.

Repairing Battery Plates

Q—It is the practice of battery repair service stations in making repairs on batteries to use the plates of the battery they represent. The Willard puts its plates in the Exide and the Exide in the Willard. What effect has this on the battery? One is a thin plate and the other a thick plate.—G. W. Erbland, Pontiac, Ill.

MOTOR AGE is advised to the contrary. In the first place Willard and Exide plates would not readily be interchangeable, although it might be possible with some fitting. A battery man in a small place might feel called upon to use plates of some other make to turn out a quick job of repairs, and if the plates could be made to fit the cells they in all probability would work, but not with the same degree of satisfaction as those made for the particular battery being repaired.

Motor Age Monthly Passenger Car Specification Tables

These prices apply to five and seven-passenger models only

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. HP.	Carburetor	Make and Size	Fuel Feed	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model	
Allen 41	5	\$1195	112	32x34	optional	3 1/2 x 5	Owen	4	22.50	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Adams	Ditweiler	Stewart	Firestone	6	90	U. S. L.	A-L	A-L	West.	Conn.	6	Allen 41
American B.	7	1865	122	32x44	Firestone	3 1/2 x 5	Ruten.	6	23.44	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	G-L	Arvac	Salisbury	Gemmer	Warner	Firestone	6	100	Col.	West.	G. & D.	A-K.	6	American B.	
American Beauty 1	5	2000	121	33x44	optional	3 1/2 x 5	Ruten.	6	23.44	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Warner	Arvac	Timken	Warner	Warner	Firestone	6	100	Willard	G. & D.	G. & D.	West.	6	American Beauty 1	
Anderson 400-A	7	1750	120	33x44	optional	3 1/2 x 5	Cont.	6	25.35	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Durston	Arvac	Col.	Jacob	Stewart	Firestone	6	80	Willard	West.	West.	Conn.	6	Anderson 400-A	
Apperson 8-18	7	4000	130	34x44	optional	3 1/2 x 5	Owen	8	33.80	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	80	Willard	Bijur	Bijur	Remy	6	Apperson 8-18	
Auburn 6-30-H	5	1595	120	33x44	optional	3 1/2 x 5	Cont.	6	25.35	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	80	Willard	Remy	Remy	Remy	6	Auburn 6-30-H	
Austin 12	6	4250	142	34x44	Goodrich	2 1/2 x 5	Weid.	12	39.08	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Muncie	Arvac	Austin	Lavine	Warner	Firestone	6	80	Willard	Delco	Delco	Delco	6	Austin 12	
Biddle H.	4	2750	121	32x44	optional	3 1/2 x 5	Buda	4	22.50	1-2 Zen.	1-2 Zen.	Vacuum	Warner	Warner	Arvac	American	Gemmer	Warner	Firestone	6	90	Willard	G. & D.	G. & D.	Eisc.	6	Biddle H.	
Brewster	5	7700	125	34x44	Kelly-S.	4 x 5 1/2	Owen	4	25.60	1-2 Zen.	1-2 Zen.	Vacuum	Owen	Warner	Arvac	Owen	Owen	Stewart	Firestone	6	80	Willard	U. S. L.	U. S. L.	Bosch	6	Brewster	
Briscoe 4-24	5	885	104	30x34	optional	3 1/2 x 5	Owen	4	15.20	1-2 Zen.	1-2 Zen.	Gravity	Owen	Owen	Arvac	Owen	Owen	Stewart	Per-Jack.	6	60	U. S. L.	A-L	A-L	Conn.	6	Briscoe 4-24	
Buick H-45	5	1495	118	33x44	Goodyear	3 1/2 x 5	Owen	6	27.34	Mar.	Mar.	Vacuum	Owen	Owen	Arvac	Owen	Owen	Stewart	Firestone	6	60	U. S. L.	Delco	Delco	Delco	6	Buick H-45	
Buick H-49	7	1785	124	34x44	Goodyear	3 1/2 x 5	Owen	6	27.34	Mar.	Mar.	Vacuum	Owen	Owen	Arvac	Owen	Owen	Stewart	Firestone	6	60	U. S. L.	Delco	Delco	Delco	6	Buick H-49	
Cadillac 57	7	3220	125	35x55	optional	3 1/2 x 5	Owen	8	31.25	1-2 Zen.	1-2 Zen.	Pressure	Owen	Owen	Arvac	C-Timk.	Owen	V. Sicken	Kelsey	6	80	Exide	Delco	Delco	Delco	6-3	Cadillac 57	
Campbell C-4	5	835	110	30x34	optional	3 1/2 x 4	Owen	4	24.03	Sund.	Sund.	Vacuum	B. and B.	Owen	Arvac	Salisbury	Owen	V. Sicken	Firestone	6	117	Willard	A-L	A-L	West.	6	Campbell C-4	
Case U.	7	1555	117	32x44	Goodyear	3 1/2 x 5	Cont.	6	29.40	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Stanwell	6	83	Willard	West.	West.	West.	6	Case U.	
Chalmers 35-C	7	1555	117	32x44	optional	3 1/2 x 5	Owen	6	29.40	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Stanwell	6	83	Willard	West.	West.	West.	6	Chalmers 35-C	
Chandler	7	1795	123	34x44	optional	3 1/2 x 5	Owen	6	29.40	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Stanwell	6	100	Willard	West.	West.	West.	6	Chandler	
Chevrolet 4-40	5	735	102	30x34	Goodyear	3 1/2 x 4	Owen	4	21.76	1-2 Zen.	1-2 Zen.	Gravity	Owen	Owen	Arvac	Owen	Warner	Stewart	Per-Jack.	6	80	Willard	A-L	A-L	Will.	6	Chevrolet 4-40	
Chevrolet F.A. 5 and 2	5	1045	108	32x34	Goodyear	3 1/2 x 5	Owen	4	21.76	1-2 Zen.	1-2 Zen.	Vacuum	Owen	Owen	Arvac	Owen	Warner	Stewart	Per-Jack.	6	80	Willard	A-L	A-L	Will.	6	Chevrolet F.A. 5 and 2	
Chevrolet F.B.	7	1135	110	33x44	Goodyear	3 1/2 x 5	Owen	4	21.76	1-2 Zen.	1-2 Zen.	Vacuum	Owen	Owen	Arvac	Owen	Warner	Stewart	Per-Jack.	6	80	Willard	A-L	A-L	Will.	6	Chevrolet F.B.	
Cole Aero Eight 870	7	2595	127	33x55	Goodyear	3 1/2 x 4 1/2	North.	8	39.20	1-2 Zen.	1-2 Zen.	Vacuum	North.	Owen	Arvac	Col.	Jacob	Stewart	Kelsey	6	50	Prest.	Delco	Delco	Delco	6	Cole Aero Eight 870	
Columbia CD and CS.	5	1685	125	33x44	Goodyear	3 1/2 x 5	Cont.	6	29.40	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	80	Prest.	W-L	W-L	A-K.	6	Columbia CD and CS.	
Comet C-51	5	1195	115	32x44	Goodyear	3 1/2 x 5	Cont.	6	29.40	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	75	Willard	Dyn.	Dyn.	Delco	6	Comet C-51	
Commonwealth 4-40	5	1495	115	32x44	Goodyear	3 1/2 x 5	Owen	4	19.60	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	80	Willard	Dyn.	Dyn.	Delco	6	Commonwealth 4-40	
Commonwealth 6-50	5	1495	118	32x44	Goodyear	3 1/2 x 5	Cont.	6	25.35	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	80	Willard	Dyn.	Dyn.	Delco	6	Commonwealth 6-50	
Crow-Elkhart K-36	5	1095	115	32x34	Goodyear	3 1/2 x 5	Gray	4	19.60	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	100	Willard	Dyn.	Dyn.	Delco	6	Crow-Elkhart K-36	
Crow-Elkhart K-46	5	1295	116	32x34	Goodyear	3 1/2 x 5	Reuten.	4	19.60	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	120	Willard	Dyn.	Dyn.	Delco	6	Crow-Elkhart K-46	
Cunningham V-3	7	4250	132	35x55	optional	3 1/2 x 5	Owen	8	45.00	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	120	Willard	Dyn.	Dyn.	Delco	6	Cunningham V-3	
Daniels B.	7	3750	127	34x44	optional	3 1/2 x 5	H.S.	8	33.80	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	100	Willard	Dyn.	Dyn.	Delco	6	Daniels B.	
Davis J.	7	2050	124	34x44	optional	3 1/2 x 5	Cont.	6	29.40	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	100	Willard	Dyn.	Dyn.	Delco	6	Davis J.	
Davis H.	7	1595	119	34x44	optional	3 1/2 x 5	Cont.	6	25.35	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	100	Willard	Dyn.	Dyn.	Delco	6	Davis H.	
Dixie Flyer L.	5	1095	112	32x34	Goodyear	3 1/2 x 5	Owen	4	16.90	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	60	Willard	Dyn.	Dyn.	Delco	6-3	Dixie Flyer L.	
Dodge Brothers.	5	1085	114	32x34	optional	3 1/2 x 4 1/2	Owen	4	24.03	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	12	Willard	N. E.	N. E.	Conn.	12	Dodge Brothers.	
Dorris 6-80	7	3500	132	35x55	optional	4 x 5	Owen	6	38.40	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	115	Willard	West.	West.	Bosch	6	Dorris 6-80	
Dort 11	5	925	103	30x34	Goodyear	3 1/2 x 5	D-Lyc.	4	19.60	1-2 Zen.	1-2 Zen.	Gravity	Owen	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	85	Willard	West.	West.	Delco	6	Dort 11	
Elcar	5	1175	116	32x34	Firestone	3 1/2 x 5	Owen	4	19.60	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	90	Willard	Dyn.	Dyn.	A-K.	6	Elcar	
Elcar	5	1375	116	32x34	Firestone	3 1/2 x 5	Cont.	6	25.35	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	90	Willard	Dyn.	Dyn.	A-K.	6	Elcar	
Elgin Series H.	5	1395	118	32x44	optional	3 1/2 x 4 1/2	Falls	6	23.44	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	90	Willard	Dyn.	Dyn.	Wagner	6	Elgin Series H.	
Essex A.	5	1395	108	32x44	optional	3 1/2 x 5	Owen	4	18.23	1-2 Zen.	1-2 Zen.	Vacuum	Owen	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	105	Willard	Delco	Delco	Delco	6	Essex A.	
Ford T.	5	525	100	30x34	Goodyear	3 1/2 x 4	Owen	4	22.50	H-K	H-K	Gravity	Owen	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	50	Willard	Dyn.	Dyn.	none	9	Ford T.	
Franklin 9	5	2450	115	33x44	Goodyear	3 1/2 x 4	Owen	6	25.35	1-2 Zen.	1-2 Zen.	Vacuum	B. and B.	Owen	Arvac	Col.	Jacob	Stewart	Firestone	6	12	Willard	Dyn.	Dyn.	A-K.	12	Franklin 9	

Engines—Ruten, Rutenberg; Cont., Continental; Weid., Weidely; North, Northway; H.S., Herschell-Spillman; Lyco, Lycoming; D-Lyc., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-Mcf., Teetor-McFarlan; S., Monson or Duesenberg; R. & V., Root & Van Dervoort. Carburetor—Strom, Stromberg; Zen, Zenith; Ray, Rayfield; John, Johnson; Mar, Marvel; Sund, Sunderman; Stew, Stewart; H-K, Holley-Kingston; Newc, Newcomb; Scheb, Schebler; Tillok, Tillokson; Johns, Johnston. Generator and Motor—A-L, Auto-Lite; West, Westinghouse or Auto-Lite; W-L, Ward Leonard; Dyn, Dyneto; N. E., North East; L-N, Leese-Neville; A-C, Allis-Chalmers; Split, Splitdorf; S-N, Simms-Huff; G. & D., Gray & Davis. Ignition—A-K, Atwater-Kent; Conn., Connecticut; Eise, Eismann; West, Westinghouse; Will, Willard; N. E., North East; K-Remy, Kingston-Remy; Berl, Berling; Bosch-W, Bosch-Westinghouse; Split, Splitdorf. Gearset—G-L, Grant-Lee; North, Northway; B-L, Brown-Lape. Rear Axle—Col, Columbia; W-Weiss, Walker-Weiss; C-Timk, Cadillac-Timken; West-Mott, Weston-Mott. Universals—Hart, Hartford; Ther-H, Thermoid-Hardy; U. M. Co., Universal Machine Co. Speedometer—J-Man, Johns-Mausville; V-Sicken, Van Sicken.

March 6, 1919

MOTOR AGE

39

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. H. P.	Carburetor	Make and Size	Fuel Feed	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Geromino.....	7	1595	122	32x4	Goodyear	3 1/2 x 5 1/2	Ruten.	6	23.44	1-Stron.	Vacuum	B. and B.	G. L.	G. L.	Hart.	W. Weiss	C. A. S.	Stewart	Firestone	6	88	Willard	Dyn.	Dyn.	Delco	6	Geromino.
Glide 6-40.....	5	1655	119	34x4	Goodyear	3 1/2 x 5 1/2	Ruten.	6	23.44	1-Ray.	Vacuum	Ow	Ow	Ow	Spicer	American	Ditweiler	Stewart	Goodyear	6	80	Willard	West.	West.	Delco	6	Glide 6-40.
Grant.....	5	1120	114	32x3 1/2	Goodyear	3 1/2 x 4 1/2	Ow	6	21.60	Stron.	Vacuum	Durston	Durston	Durston	Mechanics	Peru	Jacob	Stanwell	Stanwell	6	90	Willard	Wagner	Wagner	Remy	6	Grant.
Harroun.....	5	995	106	30x3 1/2	Goodyear	3 1/2 x 5 1/2	Ow	4	16.90	1-Stron.	Vacuum	Ow	Ow	Ow	Mechanics	Adams	Gemmer	Stewart	Stanwell	6	80	Willard	Remy	Remy	A-K.	6-3	Harroun.
Harvard 4-20.....	2	850	100	28x3	Goodyear	3 1/2 x 4 1/2	Ow	4	14.40	1-Zen.	Gravity	Ow	Ow	Ow	Blood	Peru	Barnes	Stewart	Stanwell	6	80	Willard	Wagner	Wagner	A-K.	6-3	Harvard 4-20.
Hatfield A.....	5	1180	115	32x4	Firestone	3 1/2 x 4 1/2	G. B. & S.	4	22.50	1-Zen.	Vacuum	G. B. & S.	G. L.	G. L.	Spicer	Peru	Barnes	Stewart	Stanwell	6	100	Willard	Dyn.	Dyn.	Delco	6	Hatfield A.
Haynes 46.....	7	3250	127	34x4 1/2	optional	2 1/2 x 5 1/2	Ow	12	36.30	Ray.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Jacob	Stewart	Firestone	6	120	Willard	L-N.	L-N.	Delco	6	Haynes 46.
Haynes 45.....	7	2485	127	34x4 1/2	optional	3 1/2 x 5 1/2	Ow	6	29.40	1 1/2-Ray.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Jacob	Stewart	Firestone	6	120	Willard	L-N.	L-N.	Delco	6	Haynes 45.
Holler 206.....	5	1595	116	32x4	Goodyear	3 1/2 x 4 1/2	Cont.	8	25.35	Stew.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	50	Gould	A-C.	A-C.	Remy	6	Holler 206.
Holler 198.....	5	1605	116	34x4	Goodyear	3 1/2 x 4 1/2	Ow	8	33.80	Stew.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	50	Gould	A-C.	A-C.	Remy	6	Holler 198.
Holmes.....	7	2900	126	34x4 1/2	Goodyear	3 1/2 x 4 1/2	Ow	6	29.40	1-Newe.	Vacuum	B-L	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	12	100	Col.	Split.	Split.	A-K.	6	Holmes.
Hudson M.....	7	2200	125 1/2	35x4 1/2	optional	3 1/2 x 5 1/2	Ow	6	29.40	1-Newe.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	120	Col.	Split.	Split.	A-K.	6	Hudson M.
Hupmobile R.....	5	1335	112	32x4	Goodyear	3 1/2 x 5 1/2	Ow	4	16.90	1 1/2-Ray.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	87 1/2	Willard	West.	West.	Delco	6	Hupmobile R.
Jackson.....	5	1118	118	37x4	Goodyear	3 1/2 x 5 1/2	Ow	8	28.80	Zen.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	120	Willard	West.	West.	Delco	6	Jackson.
Jones.....	7	2100	126	34x4	Goodyear	3 1/2 x 5 1/2	Cont.	6	29.40	1 1/2-Ray.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	120	Willard	West.	West.	Delco	6	Jones.
Jordan.....	7	2475	127	32x4	U. S.	3 1/2 x 5 1/2	Cont.	6	29.40	1 1/2-Ray.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	109.8	Willard	Bijur	Bijur	Delco	6	Jordan.
King G.....	7	2150	120	34x4	Firestone	3 1/2 x 5 1/2	Ow	8	28.80	1 1/2-Ray.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	117.5	Willard	Bijur	Bijur	Delco	6	King G.
Kissel Kar.....	5-7	2550	124	32x4 1/2	Goodyear	3 1/2 x 5 1/2	Ow	6	26.30	1 1/2-Ray.	Vacuum	Warner	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	90	Willard	Remy	Remy	A-K.	6	Kissel Kar.
Kline Kar 6-42.....	5	1865	121	33x4	Goodyear	3 1/2 x 4 1/2	Cont.	6	25.35	1-Ray.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	90	Willard	West.	West.	Delco	6	Kline Kar 6-42.
Lexington R-19.....	5-7	1785	122	34x4	Goodyear	3 1/2 x 4 1/2	Cont.	6	25.35	1-Ray.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	100	Willard	West.	West.	Delco	6	Lexington R-19.
Liberty 10-B.....	5	1570	115	32x4	Goodyear	3 1/2 x 4 1/2	Cont.	6	25.35	1-Stron.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	88	Willard	Delco	Delco	Delco	6	Liberty 10-B.
Loomobile 48.....	7	142	142	35x5	Goodyear	4 1/2 x 5 1/2	Ow	6	48.60	Ow	Pressure	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	120	Willard	West.	West.	Delco	6	Loomobile 48.
Maibohm B.....	5	1290	116	32x3 1/2	optional	3 1/2 x 4 1/2	Falls	6	23.44	1-Stron.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	80	Willard	Wagner	Wagner	A-K.	6	Maibohm B.
Marmion 34.....	7	3950	136	32x4 1/2	optional	3 1/2 x 5 1/2	Ow	6	33.75	Stron.	Gravity	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	120	Willard	Bijur	Bijur	Delco	6	Marmion 34.
Maxwell 25.....	5	895	108	30x3 1/2	U. S.	3 1/2 x 4 1/2	Ow	4	21.03	1-John.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	12	35	Willard	S-H.	S-H.	A-K.	12	Maxwell 25.
McFarlan 127.....	7	4300	136	35x5	optional	4 1/2 x 5 1/2	Ow	6	48.60	1 1/2-Ray.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	120	Willard	West.	West.	Delco	6	McFarlan 127.
Merced Series 4.....	6	4500	132	32x4 1/2	optional	3 1/2 x 5 1/2	Ow	4	22.50	1 1/2-Ray.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	100	Willard	Remy	Remy	Delco	6	Merced Series 4.
Mitchell C-42.....	7	1525	127	34x4	optional	3 1/2 x 5 1/2	Ow	6	29.40	1-Ray.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	100	Willard	Remy	Remy	Delco	6	Mitchell C-42.
Mitchell D-40.....	5	1275	120	32x4	optional	3 1/2 x 5 1/2	Ow	6	29.40	1-Ray.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	100	Willard	Remy	Remy	Delco	6	Mitchell D-40.
Moline-Knight L.....	5	2000	117	34x4	optional	3 1/2 x 5 1/2	Ow	4	25.60	1 1/2-Ray.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	117	Willard	Wagner	Wagner	Delco	6	Moline-Knight L.
Monitor, M. & O.....	7	2500	122	35x4 1/2	optional	4x6	Ow	4	25.60	1-Ray.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	117	Willard	Wagner	Wagner	Delco	6	Monitor, M. & O.
Moline-Knight G.....	7	1475	117	33x4	Firestone	3 1/2 x 4 1/2	Cont.	6	29.40	1-Ray.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	88	Willard	Dyn.	Dyn.	Delco	6	Moline-Knight G.
Moore 6-66.....	7	2500	125	35x4 1/2	Miller	3 1/2 x 5 1/2	Cont.	6	19.84	1-Ray.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	110	Exide	Delco	Delco	Delco	6	Moore 6-66.
Moore 6-66.....	5	1485	114	32x3 1/2	Miller	2 1/2 x 4 1/2	Cont.	6	19.84	1-Ray.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	80	Exide	Wagner	Wagner	Delco	6	Moore 6-66.
Moore 30.....	5	1045	106	30x3 1/2	Firestone	3 1/2 x 4 1/2	G. B. & S.	4	22.50	1-K. D.	Gravity	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	80	Willard	A-L.	A-L.	Delco	6	Moore 30.
Nash 681.....	5	1490	121	33x4	Firestone	3 1/2 x 5 1/2	Ow	6	25.35	1 1/2-Ray.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	100	Willard	Delco	Delco	Delco	6	Nash 681.
Nash 682.....	7	1690	127	34x4 1/2	Firestone	3 1/2 x 5 1/2	Ow	6	25.35	1 1/2-Ray.	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	100	Willard	Delco	Delco	Delco	6	Nash 682.
National 6.....	7	2450	128	34x4 1/2	optional	3 1/2 x 5 1/2	Cont.	6	29.40	1-Ray.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	110	Willard	West.	West.	Delco	6	National 6.
National 12.....	7	3050	128	34x4 1/2	optional	2 1/2 x 4 1/2	Ow	12	39.68	1 1/2-Ray.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	110	Willard	Bijur	Bijur	Delco	6	National 12.
Oakland 34-B.....	5	1185	112	32x4	Goodyear	2 1/2 x 4 1/2	Ow	6	18.99	1-Ray.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	85	Willard	Remy	Remy	Delco	6	Oakland 34-B.
Oldsmobile 37-A.....	5	1205	112	32x4	Goodyear	2 1/2 x 4 1/2	North.	8	18.99	1-Ray.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	80	U. S. L.	Remy	Remy	Delco	6	Oldsmobile 37-A.
Oldsmobile 45-A.....	7	1700	120	34x4	Goodyear	2 1/2 x 4 1/2	Ow	8	26.45	1-Ray.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	100	Exide	Delco	Delco	Delco	6	Oldsmobile 45-A.
Olympian 45.....	5	1240	112	32x3 1/2	Miller	3 1/2 x 4 1/2	Ow	4	16.90	1-Ray.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	75	U. S. L.	A-L.	A-L.	Delco	6	Olympian 45.
Overland 90.....	5	985	106	31x4	Goodyear	3 1/2 x 5 1/2	Ow	4	18.23	1-Ray.	Vacuum	Ow	Ow	Ow	Ow	Ow	Ow	Stewart	Firestone	6	75	U. S. L.	A-L.	A-L.	Delco	6	Overland 90.

Engines—Ruten, Rutenber; Cont., Continental; Weld, Weidely; North, Northway; H-S, Herschel-Spillman; Lyco, Lycoming; D-Lyco, Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-Mof, Tector-McFarlan; #, Monson or Duesenberg; R. & V., Root & Van Dervoort. Carburetor—Stron, Stromberg; Zen, Zenith; Ray, Rayfield; John, Johnson; Mar, Marvel; Sund, Sunderman; Stev, Stewart; H-K, Holley-Kington; Newe, Newcomb; Scheb, Scheler; Tiltot, Tiltotson; Johns, Johnston. Generator and Motor—A-L, Auto-Lite; West, Westinghouse; #, Westinghouse or Auto-Lite; W-L, Ward Leonard; Dyn, Dyneco; N. E., North East; L-N, Leese-Neville; A-C, Allis-Chalmers; Split, Splittorf; S-N, Simms-Huff; G. & D., Gray & Davis. Ignition—A-K, Atwater-Kent; Conn, Connecticut; Else, Eisemann; West, Westinghouse; Will, Willard; N. E., North East; K-Remy, Kingston-Remy; Berl, Berling; Bosch-W, Bosch-Westinghouse; Split, Splittorf. Gearset—G-L, Grant-Lee; North, Northway; B-L, Brown-Lipe. Rear Axle—Col, Columbus; W-Weiss, Walker-Weiss; C-Tmk, Cadillac-Timken; West-Mott, Weston-Mott. Universals—Hart, Hartford; Ther-H, Thermoid-Hardy; U. M. Co., Universal Machine Co. Speedometer—J-Man, John-Mansville; V-Sicklen, Van Sicklen.

Motor Age Monthly Passenger Car Specification Tables—Concluded

Name and Model	Boating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. H. P.	Carburetor Make and Size	Fuel Feed	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Owen Magnetic O-36.	7	4200	142	35x5	Optional	3 1/2 x 5 1/2	Boria	6	35.35	Zen.	Vacuum	Own	Own	Spicer	Amer.	Own	Warner	Firestone	24	.....	Willard	Own	Own	Bosch	24	Owen Magnetic O-36.
Owen-Magnetic, W-42.	7	5500	142	35x5	Optional	3 1/2 x 5 1/2	Weld.	6	38.40	Zen.	Vacuum	Own	Own	Spicer	Amer.	Own	Warner	Firestone	28	.....	Willard	Own	Own	Bosch	28	Owen-Magnetic, W-42.
Packard 3-25.	7	4800	142	35x5	Goodyear	3 1/2 x 5 1/2	Own	12	43.20	Own	Pressure	Own	Own	Spicer	Own	Own	Waltham	Firestone	6	120	Willard	Bijur	Bijur	Delco	7	Packard 3-25.
Packard 3-35.	7	5150	142	35x5	Goodyear	3 1/2 x 5 1/2	Own	12	43.20	Own	Pressure	Own	Own	Spicer	Own	Own	Waltham	Firestone	6	120	Willard	Bijur	Bijur	Delco	7	Packard 3-35.
Paige 6-55.	7	2060	127	34x4 1/2	optional	3 1/2 x 5 1/2	Cont.	6	29.40	1 1/2 - Ray.	Vacuum	B. and B.	Own	Spicer	Own	Own	Stewart	Kelsey	6	103.4	Willard	Remy	Remy	Delco	6	Paige 6-55.
Paige 6-39.	5	1555	117	33x4	optional	3 1/2 x 5 1/2	Ruten.	6	23.44	1 - Strcm.	Gravity	B. and B.	Own	Spicer	Own	Own	Stewart	Kelsey	6	103.4	Willard	Remy	Remy	Delco	6	Paige 6-39.
Paterson 6-46.	7	1625	120	33x4	Goodyear	3 1/2 x 4 1/2	Cont.	6	25.35	1 1/2 - Strcm.	Vacuum	B. and B.	Own	Hartford	Own	Own	Stewart	Firestone	6	80	Willard	Delco	Delco	Delco	6	Paterson 6-46.
Peerless Series 4.	7	2760	125	34x4 1/2	Goodyear	3 1/2 x 5 1/2	Own	8	33.80	Ball	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Firestone	12	125	Willard	A-L.	A-L.	A-K.	6	Peerless Series 4.
Phaiana R.	7	5000	125	32x4 1/2	U. S.	3 1/2 x 5 1/2	Own	4	24.70	1 1/2 - H. & N.	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Firestone	6	.....	Willard	W-L.	W-L.	Bosch	6	Phaiana R.
Piedmont.	5	1095	114	32x3 1/2	.....	3 1/2 x 5 1/2	Own	4	19.60	Carter	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Firestone	6	.....	Willard	W-L.	W-L.	Bosch	6	Piedmont.
Piedmont 6-40.	7	1545	120	32x4	.....	3 1/2 x 4 1/2	Cont.	6	25.35	Zen.	Pressure	B. and B.	Own	Spicer	Own	Own	Stewart	Firestone	6	.....	Willard	W-L.	W-L.	Bosch	6	Piedmont 6-40.
Pierce-Arrow 48.	7	6500	142	35x5	Goodyear	4 1/2 x 5 1/2	Own	6	45.65	Own	Pressure	B. and B.	Own	Spicer	Own	Own	Stewart	Firestone	6	135	Willard	West.	West.	Delco	6	Pierce-Arrow 48.
Pilot.	.....	119	32x4	Miller	.....	3 1/2 x 5 1/2	Tector	6	23.44	1 1/2 - Tillot.	Vacuum	B. and B.	Own	Hart.	Own	Own	Stewart	Goodrich	6	.....	Prest.	Delco	Delco	Delco	6	Pilot.
Premier 6-C.	7	2555	126	32x4 1/2	Firestone	3 1/2 x 5 1/2	Own	6	27.34	1 1/2 - Johns.	Vacuum	B. and B.	Own	Spicer	Own	Own	Stewart	Firestone	6	123.5	Willard	Delco	Delco	Delco	6	Premier 6-C.
Reo T.	5	1395	120	34x4	U. S.	4 1/2 x 4 1/2	Own	4	27.23	1 - John.	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Firestone	6	108.5	Willard	N. E.	N. E.	Remy	6	Reo T.
Revere.	7	355	131	32x4 1/2	optional	4 1/2 x 6	.....	4	30.63	1 1/2 - Strcm.	Vacuum	B-L	Own	Spicer	Own	Own	Stewart	Houk	6	110	Willard	Remy	Remy	Bosch	6	Revere.
Roamer 6-54.	7	123	123	32x4 1/2	Goodyear	3 1/2 x 5 1/2	Cont.	4	29.40	1 1/2 - Strcm.	Vacuum	B. and B.	Own	Arvac	Own	Own	Stewart	Hayes	6	115	Col.	Bijur	Bijur	Bosch	6	Roamer 6-54.
Saxon Y-18.	5	1195	112	32x3 1/2	Goodyear	2 7/8 x 4 1/2	Cont.	6	19.84	1 - Strcm.	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Firestone	6	60	Prest.	Wagner	Wagner	Remy	6	Saxon Y-18.
Sayers, A.	5	118	32x4	.....	Goodyear	3 1/2 x 4 1/2	Own	6	29.40	Zen.	Vacuum	B. and B.	Own	Spicer	Own	Own	Stewart	Firestone	6	85	Prest.	Wagner	Wagner	Remy	6	Sayers, A.
Scripps-Booth 6-39.	5	1295	112	32x4	Goodyear	2 1/2 x 4 1/2	North.	6	25.19	1 - Mar.	Vacuum	North.	Own	Spicer	Own	Own	Stewart	Firestone	6	88	Willard	A-C.	A-C.	Remy	6	Scripps-Booth 6-39.
Seneca H.	5	990	108	30x3 1/2	optional	3 1/2 x 4 1/2	LeRo	4	15.63	1 - Schob.	Vacuum	North.	Own	Spicer	Own	Own	Stewart	Firestone	6	102	Willard	West.	West.	Remy	6	Seneca H.
Singer, 19.	7	2000	139	35x5	Goodyear	4 x 5 1/2	H-S	3	38.80	1 1/2 - Ray	Vacuum	B. and B.	Own	Spicer	Own	Own	Stewart	Firestone	6	102	Willard	West.	West.	Remy	6	Singer, 19.
Standard G.	7	2750	127	34x4 1/2	Firestone	3 1/2 x 5 1/2	Own	6	25.35	1 1/2 - Schob.	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Firestone	12	75	Willard	Delco	Delco	Delco	12	Standard G.
Stearns SKI-4.	5	2100	125	34x4 1/2	Goodyear	3 1/2 x 5 1/2	Own	6	25.35	1 1/2 - Schob.	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Firestone	6	90	Willard	Delco	Delco	Delco	6	Stearns SKI-4.
Stephens 76.	6	1850	118	32x4	optional	3 1/2 x 4 1/2	R. & V.	6	36.04	1 1/2 - Ball	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Firestone	6	80	Willard	Wagner	Wagner	Remy	6	Stephens 76.
Studebaker EG.	7	1955	126	32x4 1/2	Goodyear	3 1/2 x 5 1/2	Own	6	29.40	1 1/2 - Ball	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Firestone	6	80	Willard	Wagner	Wagner	Remy	6	Studebaker EG.
Studebaker EH.	5	1555	119	32x4	Goodyear	3 1/2 x 5 1/2	Own	6	29.40	1 1/2 - Ball	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Firestone	6	80	Willard	Wagner	Wagner	Remy	6	Studebaker EH.
Studebaker SH.	5	1125	112	32x3 1/2	Goodyear	3 1/2 x 5 1/2	Own	4	19.60	1 1/2 - Strcm.	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Firestone	12	.....	Willard	Wagner	Wagner	Remy	6	Studebaker SH.
Stutz G.	6-7	2850	130	32x4 1/2	Templar	4 1/2 x 6	Own	4	30.63	Zen.	Pressure	Own	Own	Spicer	Own	Own	Stewart	Firestone	6	100	Col.	Remy	Remy	Remy	6	Stutz G.
Templar 445.	5	2155	118	32x4	Templar	3 1/2 x 5 1/2	Own	4	18.23	1 1/2 - Zen.	Vacuum	B. and B.	Own	Spicer	Own	Own	Stewart	Firestone	6	.....	Willard	Dyn.	Dyn.	Delco	6	Templar 445.
Tulsa, D.	5	1150	117 1/2	33x4	optional	4 x 3 1/2	Lycro.	4	19.60	1 - Zen.	Vacuum	B. and B.	Own	Spicer	Own	Own	Stewart	Firestone	6	105	Willard	Remy	Remy	Remy	6	Tulsa, D.
Velle 38.	5	1465	115	32x4	Goodyear	3 1/2 x 4 1/2	Cont.	6	25.35	1 1/2 - Ray.	Vacuum	B. and B.	Own	Spicer	Own	Own	Stewart	Firestone	6	109.8	Willard	Delco	Delco	Delco	6	Velle 38.
Westcott S-18A.	7	2590	125	32x4 1/2	Firestone	3 1/2 x 5 1/2	Cont.	6	29.40	1 1/2 - Ray.	Vacuum	B-L	Own	Spicer	Own	Own	Stewart	Firestone	6	120	U. S. L.	Delco	Delco	Delco	6	Westcott S-18A.
Willis-Knight 88-4.	7	1725	121	34x4 1/2	.....	4 1/2 x 4 1/2	Own	4	27.23	1 1/2 - Tillot.	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Firestone	6	110	Willard	Bijur	Bijur	Bosch	6	Willis-Knight 88-4.
Winton 22.	7	3350	138	35x5	optional	4 1/2 x 5 1/2	Own	6	48.60	1 1/2 - Ray.	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Firestone	6	110	Willard	Bijur	Bijur	Bosch	6	Winton 22.
Winton 22-A.	7	3200	128	35x5	.....	3 1/2 x 5 1/2	Own	6	33.75	1 1/2 - Ray.	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Firestone	6	100	Willard	Bijur	Bijur	Bosch	6	Winton 22-A.

STEAM CARS

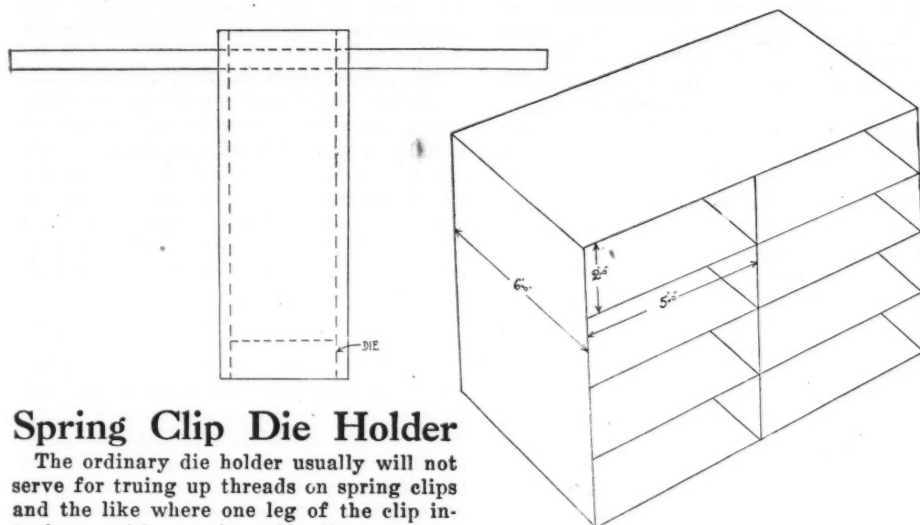
Stanley 735	7	3450	130	35x4 1/2	optional	4x5	Own	2	none	none	none	none	own	Warner	Warner	Firestone	6	Willard	Remy	none	none	6	Stanley 735.
-------------------	---	------	-----	----------	----------	-----	-----	---	-------	------	------	------	------	-----	--------	--------	-----------	---	-------	---------	------	------	------	---	--------------

Engines—Ruten., Rut.-nb.r.; Cont., Continental; Weil., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McF., Teetor-McFarlan; #, Monson or Dusenberg; R. & V., Root & Van Dervoort. **Carburetor**—Strom, Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderman; Stew., Stewart; H-K., Holley-Kingston; Newe., Newcomb; Scheb., Schebler; Tillot., Tillotson; Johns., Johnston. **Generator and Motor**—A-L., Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L., Ward Leonard; Dyn., Dyneto; N. E., North East; L-N., Leece-Neville; A-C., Allis-Chalmers; Split., Splitdorf; S-N., Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K., Atwater-Kent; Conn., Connecticut; Eise., Eisemann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy., Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitdorf. **Gearset**—G-L., Grant-Lee; North., Northway; B-L., Brown-Lipe. **Rear Axle**—Col., Columbus; W-Weiss, Walker-Weiss; C-Tumk., Cadillac-Timken; West-Mott, Weston-Mott. **Universals**—Hart., Harford; Ther-H., Thermo-Hardy; U. M. Co., Universal Machine Co. **Speedometer**—J-Man., Johns-Man; V-Siedlen, Van Siedlen.

Engines—Ruten., Rutembar.; Cont., Continental; Wei., Weidely; North., Northway; L-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McF., Tector-McFarlan; S., Monson or Duesenberg; R. & V., Root & Van Dervoort; Carburetor—Strom, Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderman; Stew., Stewart; H-K., Holley-Kingston; Newe., Newcomb; Schob., Schobler; Tillot., Tillotson; Johns., Johnston. Generator and Motor—A-L, Auto-Lite; West., Westinghouse; W., Willard; N. E., North East; L-N., Leece-Neville; A-C., Allis-Chalmers; Split., Splitdorf; S-N., Simms-Huff; G. & D., Gray & Davis. Ignition—A-K, Atwater-Kent; Conn., Connecticut; Eise., Eismann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitdorf. Gearset—G-L., Grant-Less; North., Northway; B-L., Brown-Lipe. Rear Axle—Col., Columbia; W-Weiss, Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott, Weston-Mott. Universals—Hart., Hartford; Ther-H., Thermoid-Hardy; U. M. Co., Universal Machine Co. Speedometer—J-Man., Johns-Mansville; V-Sicklen, Van Sicklen.

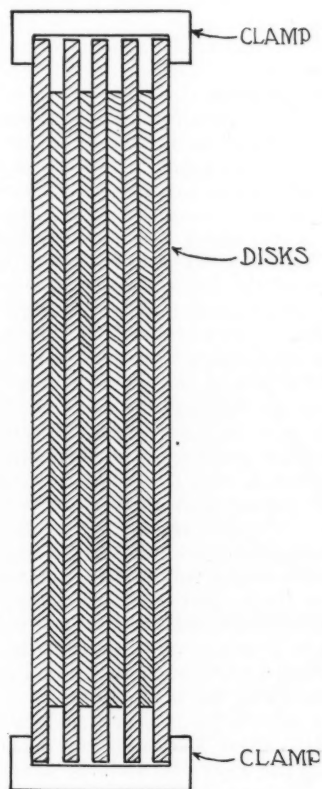
The Motor Car Repair Shop

Practical Maintenance Hints



Spring Clip Die Holder

The ordinary die holder usually will not serve for truing up threads on spring clips and the like where one leg of the clip interferes with running the die over the other. To eliminate this difficulty the die holder shown was designed, consisting of a length of tubing which houses the die at one end and has a handle inserted at the other.—Fisher Proctor, Inc., Stewart trucks, Boston, Mass.



Clutch Plate Holder

Sometimes the assembly of a multiple-disk clutch may be facilitated by compressing the disks and holding them with two or three simple clamps, as shown.—Fisher Proctor, Inc., Stewart trucks, Boston, Mass.

Shelves for Large Parts

It is unusual to see shelves used for the storage of such large, bulky parts as radiators and fenders, but one Boston truck dealer finds this method quite effective. As shown in the sketch, the shelves are 5 ft. deep, 2 ft. high and 6 ft. long.



Support for Electric Drill Cord

Garagemen and other mechanics who make use of an electric hand drill will find convenience and utility in the device for supporting the electric cord illustrated in the accompanying photograph. The support consists of a length of 1½-in. iron pipe

hinged to the wall by interlocking eyes, and supported from above by a long coil spring. Two smaller coil springs are attached to the wall and to the sides of the boom near its base. These tend to hold the boom out at right angles from the wall at all times but at the same time permit of its being swung to the right or left as desired. For reaching extreme corners of the shop the boom may be swung either to the right or left and also downward.

Obviously, this device permits the workman to move about with his drill over a considerable space without the necessity of changing his source of electric supply to some other socket. The cord is not in the mechanic's way, and it is never dragged about over the floor to be worn out, entangled with other objects, or to become smeared with grease and dirt. The cost of installing such a cord support is trivial, especially when compared with its advantages in the saving of time and increased efficiency.

This device was originated by Carl Goudy and installed in his motorcycle shop in Los Angeles, Cal.

To Make a Spring

A good method to make a spring of a required size is first to secure a bolt of that size and place the bolt in a vise. Then take the spring wire and secure one end at the head of the bolt and wind the spring wire in the thread grooves of the bolt. The coil now can be unscrewed from the bolt and stretched to the required length.

To Lubricate Springs

Lubricating the springs of a motor car with a spring spreader is a laborious process and requires much time. It is much easier to place a jack under the frame of the car. This relieves the springs of the weight of the car, and the graphite and grease then can be worked in between the leaves of the springs with a hacksaw blade. If possible, it is better to use two jacks, one under each side of the car. This raises the car evenly, and the body and frame are not distorted as when only one jack is used.

Investigate Noise

When you hear a clatter as though you had run over a tin can or some other piece of metal scrap which has found its way onto the road do not be so optimistic as to think it did not fall off the car, but go back and look carefully. One motorist lost a license tag this way, another broke the coupling between clutch and gearset because he did not stop to look when a bolt fell out. He heard it but thought nothing of it. Another lost two good wrenches and a tire pump which he had absentmindedly left on the running board. Still another lost a spare tire on the rear in the same way. It is better to be on the safe side and investigate.

Campbell All-in-Mesh Transmission

Removes Difficulties in Shifting—Gears
Always Engaged

At last the car or truck driver is able, it seems, to shift his gears without clash or danger of stripping the teeth, even though the clutch pedal is not touched while making the shift. The Campbell transmission made by the Campbell Transmission Co., Buchanan, Mich., makes this possible. While essentially of the gear type and having the general appearance of most selective types of gearsets, this transmission incorporates features which, though they appear novel, are based on sound engineering principles.

Generally speaking, the Campbell transmission is a gearset wherein the gears constantly are meshed and the countershaft or layshaft gears locked internally by what is termed a rolling key. Thus the different speeds except high gear are secured by shifting the key under the desired gear.

Design Kept Simple

In order that the transmission may be readily adapted without altering present-day chassis layouts the makers purposely have kept the design simple.

Incidentally the rolling key is not a new idea, it being an improvement of the Bliss punch press key in use for over thirty-five years. The manually-operated Bliss punch press key is slow-acting, requiring a certain amount of time for engagement, while the Campbell key rolls automatically into place regardless of engine or shaft speeds.

Inasmuch as the clutching devices are located immediately under the layshaft gears and not at the sides, the Campbell transmission is shorter than other in-mesh types, resulting in but 6 in. center to center between bearings on the layshaft, and this on a 2- to 3-ton four-speed truck transmission. This model, known as No. 50, is featured in the illustrations herewith. One of these has been in use for several months

in a 2-ton truck at the Great Lakes Naval Station where it has been subjected to severe handling. A representative of MOTOR AGE drove this truck over all sorts of roads, bringing the gearset lever into the various speeds without touching the clutch pedal and regardless of engine revolutions. It was noted that never once did the truck jerk violently as the lever was abruptly brought into another position. This is due to the fact that the engaging member on the layshaft gets fully into position before any power can be applied and the key gets no blow.

A noteworthy feature on hills with this transmission is that a lower gear can be instantly engaged, with the clutch in if desired, so that the car or truck loses no momentum. Also, in turning in a narrow street when the car is faced part way around, reverse speed can be applied while the car is still traveling forward, and while it reverses the forward speed shift can be made and the car got under way much quicker than where a full stop must be made between forward and reverse speeds. While the Campbell gearshift lever slot is arranged in a progressive form, the

operation is selective. Also, while no harm is done by not declutching as the shifts are made, the maker advises against this practice being generally adopted, for obvious reasons.

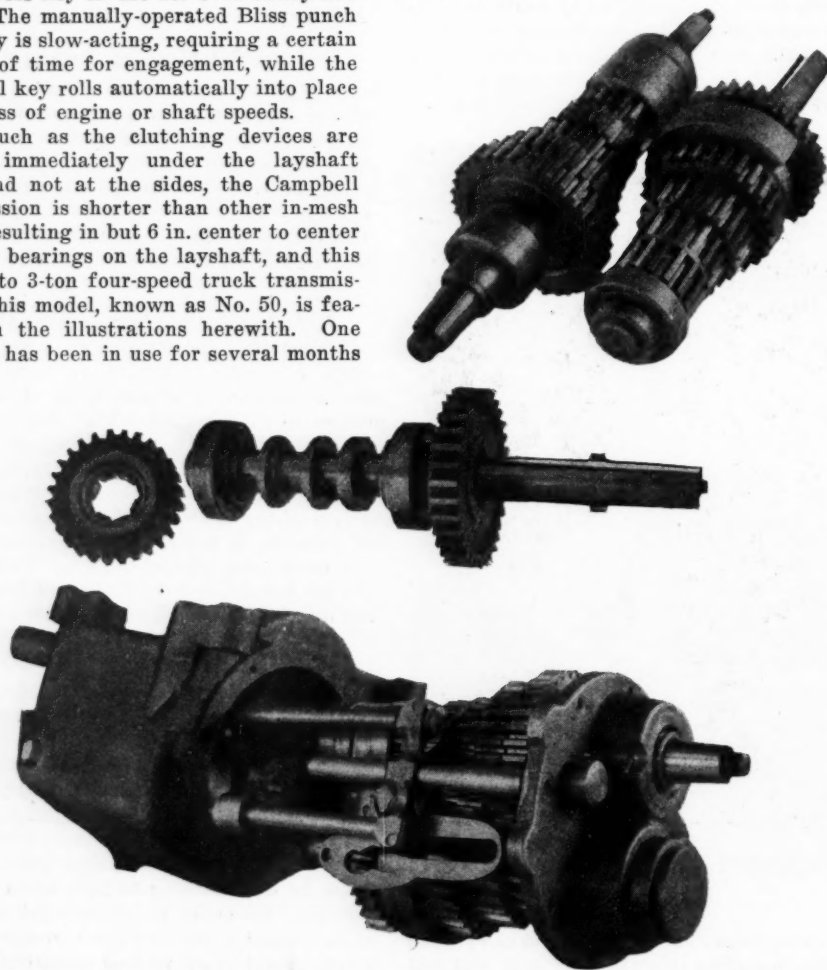
The primer shaft connects to the engine or clutch shaft and carries on its inner end a constant-mesh gear, as in conventional gearsets. The latter is recessed for a roller bearing supporting the mainshaft, which is supported at the rear by a double row ball bearing. The mainshaft is splined for a sliding member, while a double gear is spooled on the shaft and revolves with the shaft only when the sliding gear is clutch-meshed with it, that is, the external teeth of the sliding gear are meshed with the internal teeth of the spooled gear. High gear is obtained when the sliding gear is brought forward to clutch-mesh with the gear on the end of primer shaft in practically the same way as is done in conventional gearsets, where the internally-cut form sliding gear is used in place of a dog clutch.

Immediately below the gear on primer shaft and in mesh with it is a constant gear, an integral part of the layshaft. Adjacent to it is a single row ball bearing and then follow four gears constituting the third, second, first and reverse speed gears respectively. The bearings of the layshaft are close to the gears where the greatest load comes, minimizing the danger of a sprung shaft.

Mounting of Gears

As will be noted from the illustrations the gears of the layshaft except the constant gear are mounted on collars or rings acting as bearing surfaces. The transmitting action is secured by sliding the key, or keys, along circular longitudinal grooves in the shaft until they slip under the rings of the desired gear, after which the key automatically and positively rolls into contact with one of the broached openings on the inside of the gear. This action is shown in the cross section. One key takes the load and the other the backlash. It will be noted that the cams on the keys are made with sloping surfaces, which serve a twofold purpose, to assist in the engagement of the gear and to release it. If these cams were made with square ends, the gears could not be engaged as the ends would simply butt against the collars or rings. But with the sloping surfaces the key is turned on its longitudinal axis when it comes into contact with the inner rounded portions of the collars and is sunk entirely in the shaft groove.

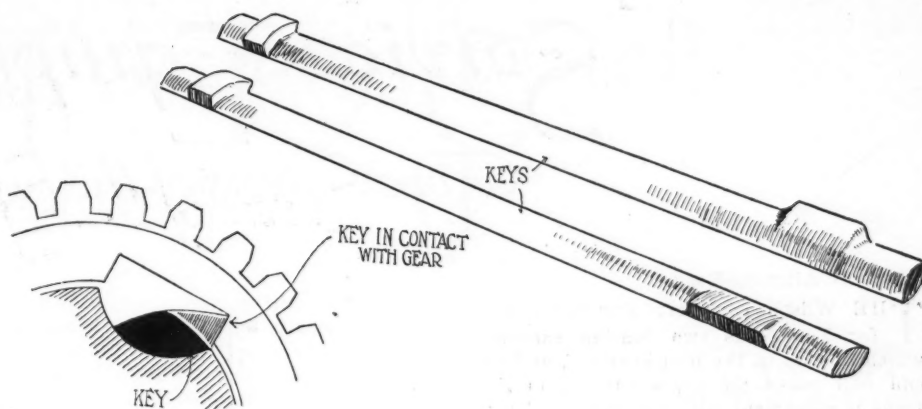
Thus a neutral point is obtained between every shift, these neutral points occurring whenever the keys are directly under the collars. Then as the shifting rod is moved to engage a gear, the key moves longitudinally, and as it comes into position under the gear a ball check which bears on the key on the opposite side of the cam rolls the latter up into the gear. Thus the gears cannot take the full load until the key has been first rolled into place.



Campbell transmission details, showing partially dissembled view exposing cam lever operating mechanism and general arrangement of gears. The layshaft shows collars forming bearing surfaces of the gears

In the Campbell transmission, it is stated, the gears cannot become noisy, as the pitch line is not disturbed. Also the tilting key clutches the gear directly in the center, and therefore the gear is not distorted on the shaft, though there may be considerable play between gear and shaft. The layshaft gears are reversible, that is, they can be turned completely around to distribute the wear.

The camplate which works in conjunction with the keyshifting mechanism makes it possible to use but a single rod between transmission and lever set. The camplate also acts as a locking means for each speed. With the camplate layout it is impossible to get two speeds at one time.



Details of keyshifting mechanism on Campbell transmission

Eco Air and Water

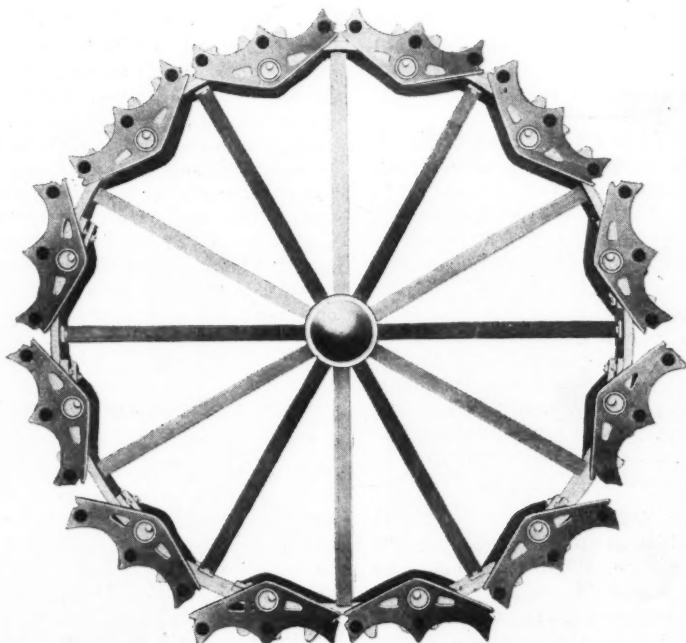
As long as the motor car dealer and service station carry along with their regular business the idea of free air they are not cashing in on what might be made a profitable part of the business. At least, this is the way the Western Mfg. Co., Oskaloosa, Iowa, looks at it. This concern makes an apparatus called the Eco air and water station to be mounted on the curb in front of the garage, or anywhere else for that matter, so that the car owner has to pay a nickel, dime or quarter for pumping up his tires. The station contains a patented inclosed, spring-operated reel-carrying air hose, controlled by a coin, making it necessary to deposit the coin before any air can be had. An automatic cutoff in the base cuts off all air pressure except when the hose is pulled out. When the hose is released the spring draws it back into the station.

Among the advantages cited for this device is that it continues giving service after closing hours, whereas many of the free air stations lock their apparatus after the garage itself is closed. One enterprising Iowa dealer counted six dimes in his station put there after closing hours, indicating six cars had stopped during the night.

The stations are built of iron with steel reel and stand about 5½ ft. high. Two types are made, one for connecting to the regular compressed air system of the garage, while the other is a complete unit in itself to be used where compressed air is not available. The customer receives practically as good service as with the other type, but the garageman saves the loss due to leaky valves, pipe line and tank, as well as saving initial investment. The unit can be set anywhere where water and electric current are available. The compressor runs only while the station is being used, while a relief valve guards against too great a pressure. At night these stations are lighted electrically, if desired, making them easy to locate.

More Wheel Traction

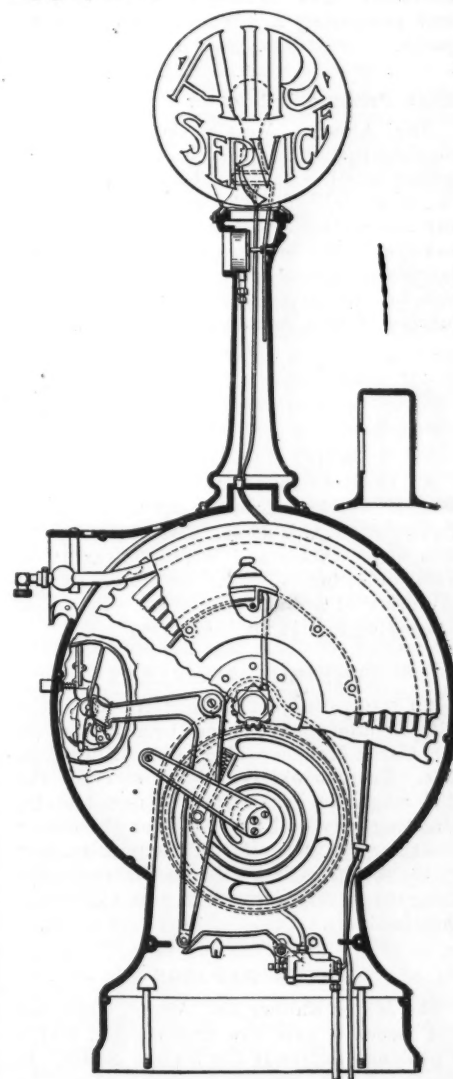
THE Grid Iron Grip Co., Rock Island, Ill., has brought out a new device for securing added traction from the regular tractor wheel. That added surface is secured can be seen from the accompanying illustration. These grips can be applied quickly to any tractor wheel and wheels equipped with them travel very much like those of the caterpillar or crawler type, it is said.



Grid Iron grips for application to the regular tractor wheel

The tractor wheel in turning presents these grids to the road.

The grid is pivoted loosely on the casting, which is bolted to the wheel, and is so designed that two of the grids will be in contact with the road at all times. The grid performs two duties, that of providing traction and that of providing a track for the wheel to roll in. A straight runway is cast on the grid, and on this the outer periphery of the wheel rolls. Another feature claimed for the grid is its self-cleaning properties.



Eco air and water station, showing inner mechanism

Service Equipment

Time Savers of the Shop

Camshaft Aligning-Reamer

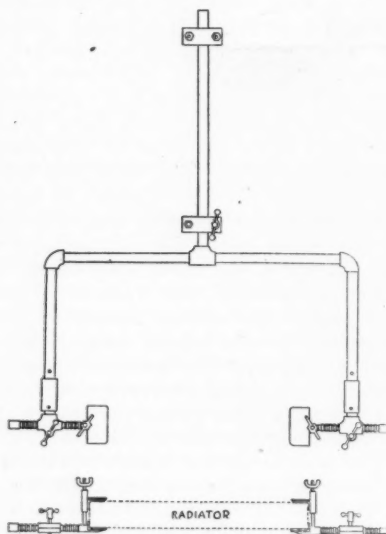
THE Wilson camshaft aligning-reamer for Fords has two bearing surfaces which line up in the iron bearings, and an end mill reams the brass bushing in the front in alignment with the two iron bearings. This end mill has a Morse taper and easily can be removed from the other part of the device. The price is \$10 complete with wrench and the maker is K. R. Wilson, Buffalo, N. Y.

Tire Repair Patch

The Auto-new-matic patcher recently announced by the Loctite Patch Co., Detroit, is called the "Workshop on the Road." This is not a vulcanizer but a container which has the rubber cement within and is so shaped that the tube in being repaired can be clipped around the container, thus holding it perfectly tight and presenting a smooth surface for the patch.

High Pressure Lubricator

The Alemite Metals Co., Chicago, is manufacturing a lubricator that forces the grease into the bearing at a pressure of 500 lb., it is claimed. The grease cups of the car are replaced with special nipples that come with the lubricant. The hose of the lubricator is attached to the special connection on the nipple and the plunger of the lubricator then is turned down. The hose



of the lubricator is made of braided steel, so there is no composition or rubber tubing to replace.

Radiator Holder

The O. K. radiator holder, invented and patented by August L. W. Ohmacht, Cresco, Ohio, is a device that makes easy the repair of the radiator. Many times in repairing radiator leaks, especially those in a corner and down inside, the solder runs all over the iron, the table and not the



Two views of O. K. radiator holder

place where it should go. With the aid of this holder, though, the radiator can be held in any position. The illustration shows the application of the holder. It is clamped to a bench by two clamps in which the main support rests and can turn. One of these clamps has a make-fast arrangement which holds the main support in its set position. By variable jaws the width of the opening can be varied, and this is made fast by a clamp screw. The thickness of the radiator shell is compensated for by the clamps on the moving jaws.

When Makers Turn Publishers

WHEEL EVOLUTION

A booklet called "The Birth of a Wheel" has been brought out by the Clark Equipment Co., Buchanan, Mich., maker of disk steel wheels and internal gear axles. This describes the various steps in the evolution of a disk steel wheel. It is well illustrated and is mailed on request.

THE BILL BOOKLETS

An interesting set of booklets called the Bill Booklets have been brought up by the Cutler-Hammer Mfg. Co., Milwaukee, Wis. These booklets tell the story of the C-H magnetic gearshift in a new and interesting way and are both for the dealer and the manufacturer. Bill is a dealer, new at the business but sold on his car. His doings constitute a series of nine 4¼ by 5½ thin booklets.

TIRE REPAIRS

The Miller Rubber Co., Akron, Ohio, has just issued a new tire repair book, which is designed expressly for the car owner. It treats largely of those repairs that can be made at home but discourages the idea of the motorist's attempting extensive repairs when crude workmanship is likely to ruin

the tire. Frequent as well as some unusual causes of tire trouble are discussed. Whenever it is feasible to do so, a specific and practical remedy is suggested.

PROFITABLE FARM HAULING

"Profitable Farm Hauling with Motor Trucks" is the business-like title of a booklet just issued by the Goodyear Tire & Rubber Co., Akron, Ohio. Here is considered the practicability of the motor truck as a farm tool, with emphasis on pneumatic tire equipment. The new booklet is primarily one discussing the many ways in which motor trucks may fit into farming activities and is intended to illustrate the progress Goodyear has made in the big pneumatic cord truck tire field.

PEDIGREED GEARS

The tractor department of the R. D. Nuttall Co., Pittsburgh, Pa., has brought out an attractive illustrated book on "Pedigreed Gears." The publication describes and explains Nuttall tractor gears for the benefit of tractor owners and tractor manufacturers. It also contains valuable information on the causes of gear troubles and inefficiency.

KEEPING TAB ON TRUCKS

"How to Keep Tab on Your Motor Truck" is a small booklet published by the Service Recorder Co., Cleveland, Ohio, which takes the position that the only commodity a motor truck deals in is running time and that all truck efficiency is directed toward the goal of increasing that running time. The obvious way of increasing running time is by cutting down idle time, says the booklet, and what more direct way, it asks, is there of doing this than to find out just what delays occur each day, when they occur and the length of each delay.

TRUING UP WHEELS

"Truing Up Wheels" is the first of a new series of tire conservation booklets to be issued by the Goodyear Tire & Rubber Co., Akron, Ohio. In it is shown the abnormal wear a tire undergoes when run on wheels out of alignment. It shows how bumping into curbs, hitting bumps in the road, turning out into gutters and similar strains are likely to throw a wheel out of true and how tires run on wheels that are badly out of line travel with a skidding action that wears down treads very rapidly.

The Accessory Corner

New Fitments for the Car

Anti-Rattler for Fords

A SPRING clip device made by the Fernald Mfg. Co., Inc., North East, Pa., is claimed to silence rattles from brake rods and steering knuckles. It is a spring that fastens on around the member and keeps the play out of the joint by holding the two pieces together. It is applicable to Ford, Dodge Brothers and Maxwell cars.

Rado-Meter

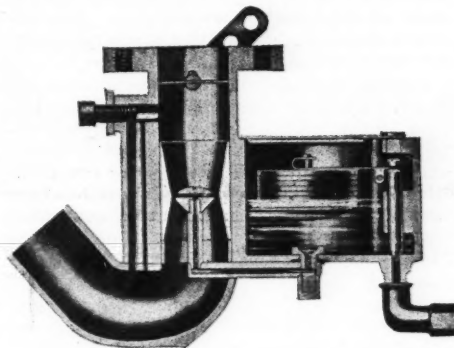
The Rado-Meter Co., Seattle, Wash., is offering a new device that instantly tells the water level in the radiator and will give a warning should the engine boil. It is a float arrangement that rides with the water and the red indicator in the gage moves to the corresponding position. The danger of low water is immediately made apparent, without the inconvenience of getting out of the car.

New Sunderman Carbureter

A principle slightly different from that heretofore used in carburetion is employed in the Nitro-Sunderman carbureter, made by the Sunderman Corp. of Newburgh, N. Y. A venturi tube which rides up and

down on the intruding air current is the means that controls the velocity and quantity of the air. The gasoline passage is of the fixed opening type but is not a mere jet. The gasoline coming into the inlet passage encounters a mushroom nozzle, which has four holes drilled in it, and through these holes the gasoline is drawn out in a fan-shaped spray, where it encounters the air as it rushes by the mushroom nozzle. The quantity of gasoline is dependent upon the

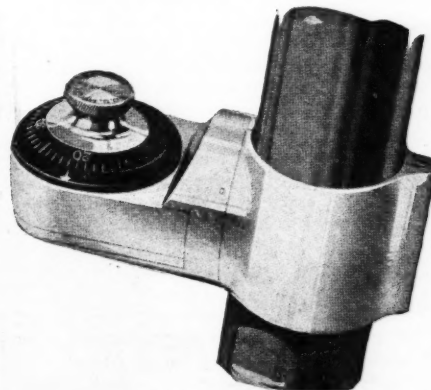
velocity of the air, which in turn is dependent upon the position of the floating venturi tube. If the throttle suddenly is opened, the venturi tube rises. This offers a restricted passage, and the air consequently increases in velocity. This draws in a heavier charge of gasoline. If the engine is idling, the venturi tube does not ride quite as high, and to operate efficiently at these slow speeds the venturi tube uncovers an auxiliary air passage, which can be adjusted by a thumb screw. This is the only adjustment on the carbureter.



Nitro-Sunderman carbureter

F. O. B. Combination Lock

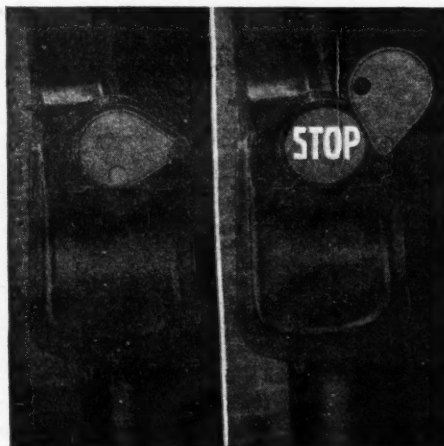
The lock is made by the F. O. B. Mfg. Co., Philadelphia, Pa., operates by a bolt which enters the steering column, holding the wheels in a rigid position which will not allow the car to be either driven or towed. Nevertheless, the car in case of emergency, may be moved forward or backward, thus complying with the ordinances in force in many cities. It is made of an aluminum alloy of great tensile strength. Attachments to the steering column casing, just below the wheel, may be effected in a few minutes. Locking is effected by a slight turn of the combination dial. The price is \$25.



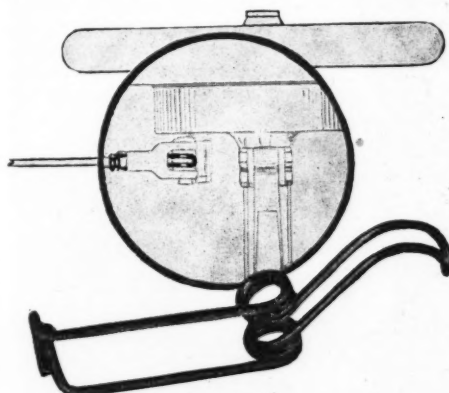
F. O. B. combination lock

Watch-A-Stop Signal

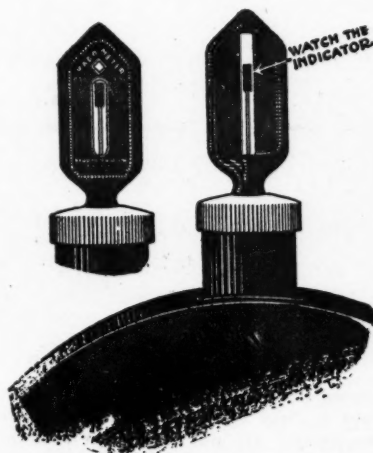
The new Watch-A-Stop safety signal, made by the Watch-A-Stop Sales Co., Philadelphia, Pa., is a device that operates entirely automatically. A guard is lifted from the front of the signal when the car is being stopped, and a warning thereby is given to the man coming from behind. When the brake lever of the car is pushed down, a link connecting to a valve on the intake manifold or the vacuum tank operates to open the valve. The vacuum operates on the piston, which opens the shutter. The automatic feature of the device makes it specially valuable to the man driving a closed car, as it is from these that the man coming on from behind cannot be seen. The signal is made in three types, one with the signal only, one with signal and license bracket and a special model for Fords, which has the bracket also.



Watch-A-Stop safety signal



B-R-A-T-S for eliminating brake rattles



Rado-Meter for indicating water level

Lamp and Plug Tester

Testing and demonstrating device for lamps and spark plugs is made by the Bergie National Spark Plug Co., Rockford, Ill. It has a simple vibrating coil to produce a high-tension current for testing the plug. The plug to be tested simply is laid across the small bracket, and if the plug is in good condition, a spark will jump across the points. There are two sockets for testing lamps, one having a single contact and the other having a double contact. The device operates on two dry cells. The price is \$5.

Among the Makers and Dealers

Short Trade Notes

SERVICE Truck Declares Dividend—The Service Truck Co. has declared a dividend of 6 per cent, which makes a total for the year of 15 per cent.

Coe-Stapely New Vice-President—George K. O'Donnell has been elected vice-president in charge of sales for the Coe-Stapely Mfg. Corp., which manufactures tire pumps, jacks and other accessories with headquarters in New York.

Star Rubber Adds—The Star Rubber Co. is building an addition to its plant at an estimated cost of about \$200,000. It will provide an extension of mill room space and storage room for raw material. It is expected to be ready for occupancy by May 1.

New Policy for Equipment Company—The Gaul, Derr & Shearer Co., Philadelphia, Pa., dealer in garage equipment, air compressors and motor car hardware, after March 1 discontinues its retail trade wholly and will run its business for the wholesale trade only.

Rickenbaugh Manager of Scott—G. B. Rickenbaugh, formerly with the Irving National Bank of New York, has been elected vice-president and general manager of the Scott Corp. of New York. The Scott Corp. deals in accessories extensively, having offices in London and Paris.

Ahlberg Bearing Erects New Factory—A new factory building is under construction and when completed will be occupied by the Ahlberg Bearing Co., Chicago. The building is in the heart of Chicago's motor district and will be equipped to give 24-hr. service on any bearing grinding job.

Monarch Tractor Declares Dividends—The Monarch Tractor Co., Watertown, Wis., has declared a 6 per cent dividend. This was payable to stockholders and employees. A man's salary during the year represents so much stock and he draws dividends on this as well as the man who pays in money for the financing of the company.

Changes in Selden Organization—Clifford M. Snow, formerly sales manager of the southern division for the Selden Truck Sales Co., Rochester, N. Y., is now special field representative with that company, and on March 1 will take up his new duties with headquarters in San Francisco. Milner T. Lahatte, Mr. Snow's former assistant, will be his successor in the former position.

Head of Turner Dies—Judge William J. Turner, Milwaukee, Wis., president of the Turner Mfg. Co., Port Washington, Wis., manufacturer of Simplicity tractors and engines, died Feb. 15. He was seventy-one years old. His son, Lee M. Turner, is vice-president and general manager of the company. Judge Turner occupied the circuit court bench in Milwaukee for the last ten years but previously devoted considerable attention to the management of the Turner business.

Goodyear Makes New Appointments—The Goodyear Tire & Rubber Co., Akron, Ohio, is making several changes due to its expansion for the European business it is now planning to handle. C. H. Williams, formerly manager of the Chicago branch, has been appointed manager of the far eastern division, which covers the Philippines, China, Japan, Java, Siam, India, and Eastern Russia. G. L. Diers, formerly manager of the Indianapolis district, has been made manager of the

European division of the export department. A. G. Cameron, for several years manager of the St. Louis branch, has been appointed manager of the Australian division.

White Declares Dividends—White Co., Cleveland, Ohio, has declared a regular quarterly dividend of \$1 a share payable March 31 to stockholders of record March 15.

Jay Heads Stanley Motor—Frank Jay was elected president and general manager of the Stanley Motor Carriage Co. at the annual meeting of the company Feb. 20.

Holt Tractor in Dakota—H. P. Smith, of the Holt Mfg. Co., Peoria, Ill., has opened a distributing house in Fargo, N. D., under the name of the Dakota Caterpillar Co. The territory includes all of North Dakota and western Minnesota.

Holmes Foundry Is Fire-Swept—The big South Park plant of the Holmes Foundry Co., Port Huron, Mich., burned to the ground entailing a \$150,000 loss fully covered by insurance. The plant was the larger of two foundries operated by the company which has been making castings for automotive companies and recently closed a contract for castings for the General Motors Corp. The foundry

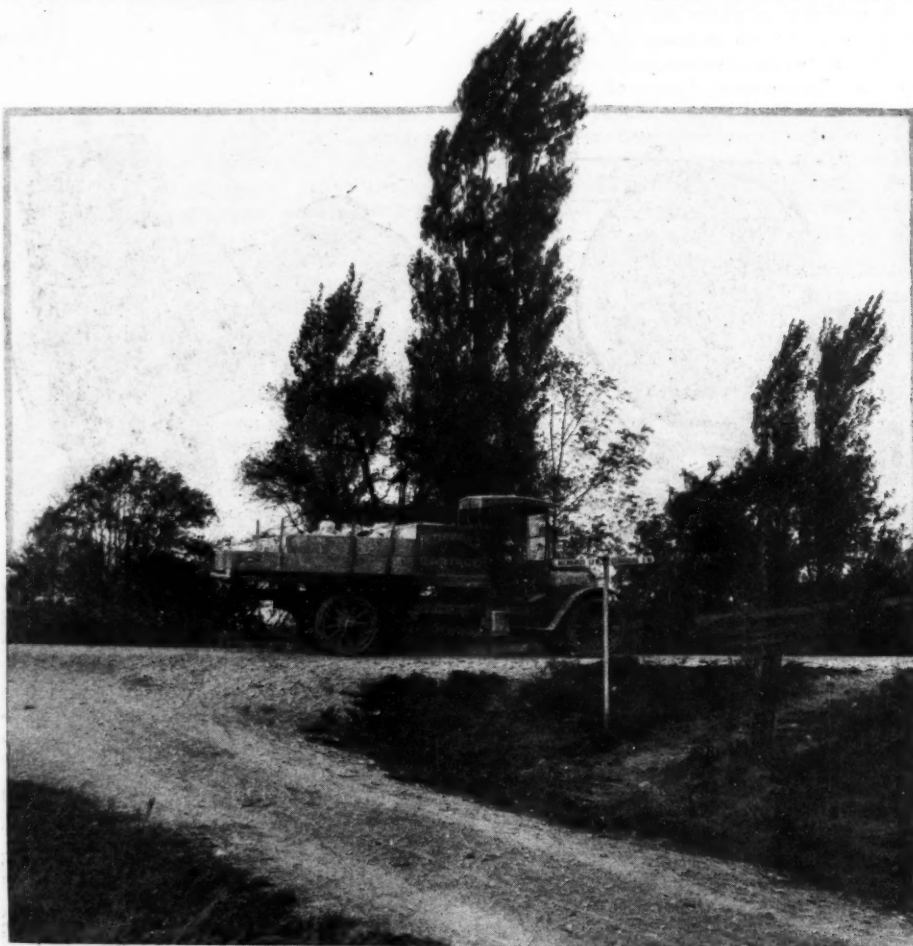
will be rebuilt, reconstruction work commencing immediately after the fire. The company hopes to be in operation again within sixty days.

Rumely Is Parrett Vice-President—Leo M. Rumely has been made vice-president of the Parrett Tractor Co., Chicago. He will be in charge of the sales, advertising and service departments.

Roamer Adds New Department—The Barley Motor Car Co., Kalamazoo, Mich., has added a new custom-made body department. The company now can make all its special bodies.

Gramm-Bernstein Sales to Be Direct—The Gramm-Bernstein Motor Truck Co., Lima, Ohio, is notifying its dealers in the eastern territory that hereafter sales and service in that territory will be directed from the factory.

Overland Opens Trade School—A trades and technical school to increase the efficiency of employees has been opened by Willys-Overland. The school occupies the parts of two floors of one of the factory buildings and contains machine shops, tools and die rooms, inspection, drafting and lecture rooms and to



HERE'S TRUCK PERFORMANCE FOR YOU—Peter Baur, of Milwaukee, has great faith in motor trucks. Recently he had a contract to haul from the lime kilns near Cedarburg, Wis., into Milwaukee, about 19 miles away. He put a 1½-ton Federal truck to work with two drivers, working double shift. This truck made six round trips every 24 hr., hauling 2½ tons a load—traveling 228 miles and hauling 15 tons a day.

start will have accommodations for several hundred workers. It is open to all employees who will receive within 10 per cent of their regular wages.

Hanson & Tyler Sell Dart—The Hanson & Tyler Auto Co., Fort Dodge, Iowa, with branches in Sioux City, Iowa; Sioux Falls, S. D.; Webster City and Des Moines, will sell the line of the Dart Truck & Tractor Co. in western Iowa and South Dakota.

Ames Joins Black & Decker—R. G. Ames has joined the Black & Decker organization in the capacity of branch manager in charge of the Chicago office. Mr. Ames was formerly in the accessory field, having been with the Edward A. Cassidy Co. of New York for ten years.

Fort Wayne Has New Truck Company—The Evans Truck & Axle Co., Fort Wayne, Ind., has been organized with a capital of \$500,000. G. R. Gunderson has been elected president; William J. Robinson, vice-president, and R. H. Evans, secretary-treasurer and general manager.

To Make Patented Inner Tubes—The North Star Rubber Works, organized recently at Milwaukee, Wis., to engage in the manufacture of patented safety inner tires and similar goods, has decided to locate in Fond du Lac, Wis. A building has been leased for factory purposes and now is being equipped.

Chain of Service Stations—A chain of ten service stations in cities between Portland, Ore., and San Francisco, Cal., several of which will be managed by his soldier sons, will be established by Frank Miller, well-known hop buyer of Yamhill County. Work has been started on the first station at McMinnville, Ore.

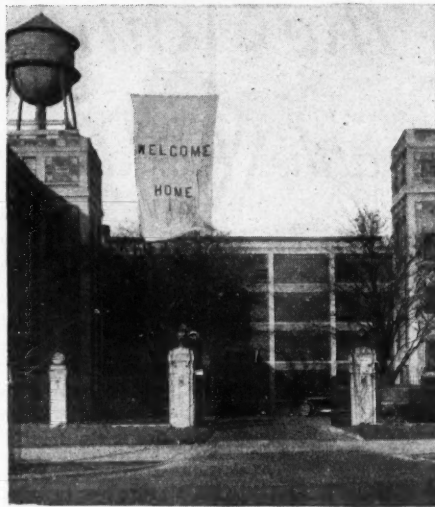
Briscoe Places Territory—The Briscoe Motor Corp., Jackson, Mich., has appointed the Garland Automobile Co., New York, distributor for the metropolitan territory on Briscoe cars. The company has also closed a similar contract with the Interstate Automobile Co., Moline, Ind., and the Twyman Automobile Co., Columbus, Ohio.

Nelson Becomes Premier Engineer—A. L. Nelson has been appointed chief engineer of the Premier Motor Corp., Indianapolis, Ind., succeeding C. S. Crawford, who has been promoted to director of engineering and assistant general manager. During the war Mr. Nelson was consulting engineer of aircraft armament at McCook Field, Dayton, Ohio.

Change in Dart Personnel—C. C. Wolf has been elected president of the Dart Truck & Tractor Corp., Waterloo, Iowa. W. H. Johnson is now general manager in charge of plant production. M. D. Herron was elected vice-president and sales director. H. H. Henry, retiring president, has accepted the presidency of the Maxim Munitions Corp.

Cravath Now Vice-President of Hession—The directors of the Hession Tiller & Tractor Corp., Buffalo, N. Y., manufacturer of the Wheat tractor, have elected L. B. Cravath vice-president and a director. Mr. Cravath has been with the Hession company only a few months and in that time has acted as sales manager, then general manager.

Old Employees Return to Pennsylvania—Four employees of the Pennsylvania Rubber Co. who have recently been discharged from service have returned to their former positions. Lieut. George Blair, who has been in the Naval aviation service for the last eighteen months, has resumed his position as manager of the Philadelphia branch. P. F. Armitage, in the Naval revenue force for the last year, has again taken up the northeastern Pennsylvania territory with headquarters at the Philadelphia office. Milton H. Batz, who was with the company for eight years until he went into the army eight months ago, is now back on his territory in western New



DEALER SAYS WELCOME—This is the welcome the Henshaw Co., Boston, Mass., gives its 285 employees who entered the service. They will get their old jobs back

York, and William E. Little, for the last six months with the Motor Instruction Division, is back on his territory in central Pennsylvania.

Avery Has New Madison Manager—R. B. Lyman has been promoted to the position of manager of the Madison, Wis., branch of the Avery Tractor Co. of Peoria, Ill.

Smith with Parrett Tractor—F. H. Smith, for the last twelve years sales manager for such companies as Studebaker, Hudson and Chalmers, is now sales manager of the Parrett Tractor Co., Chicago.

Puttman Is Advanced Again—C. S. Puttman has been appointed manager of the Detroit branch of the United States Tire Co. He started with that company in 1911 as a stock record clerk, and his advancement has been rapid.

Troupe to Manage Fisk Sales—C. F. Troupe, who represented the Fisk Rubber Co. in the east and south, has succeeded Frank Lee as sales manager of that company in Wisconsin and upper Michigan. Mr. Lee recently resigned.

New Vice-Presidents for Republic—Harvey J. Woodard, sales director, has been appointed vice-president in charge of sales and Mark W. Roe consulting engineer-vice-president in charge of the plant for the Republic Rubber Co., Youngstown, Ohio.

Keith Succeeds DuPuy—Carl L. DuPuy, with Selden for eleven years, has resigned and is succeeded in the Texas and Oklahoma territory by M. B. Keith, for several years president of the Texas Truck Co., handling the Selden line in Dallas, Tex.

New Simms Production Engineer—G. M. Rymarczick, until recently supervising senior inspector of the magneto section of the Bureau of Aircraft Production, is now connected with the Simms Magneto Co., East Orange, N. J., as production engineer.

Strieby with Fulton Truck—C. M. Strieby, former advertising and sales manager of the Smith Motor Truck Corp., Chicago, has been appointed advertising manager of the Fulton Motor Truck Co., Farmingdale, L. I. He formerly was with Maxwell and Studebaker.

District Reorganization for Dart—The Dart Truck & Tractor Corp., Waterloo, Iowa, has reorganized its district representatives. A. W. Cook will have charge of Iowa, Nebraska and South Dakota; W. M. Kline, Kansas, Oklahoma and Missouri; R. C. Nethraeus, Texas and Louisiana; A. H. Kreidler, Arkan-

sas and Mississippi; H. P. Federspiel, Indiana, Illinois and Kentucky. The Atlantic seaboard and export distribution will be handled by the Maxim Munitions Corp., New York.

Weddell Now Advertising Manager of Firestone—Justin R. Weddell has been appointed advertising manager of the Firestone Tire and Rubber Co., Akron, Ohio. Mr. Weddell for the last three years has been sales manager of the Corday & Gross Co., which took over the company that Mr. Weddell organized.

Bay Returns to Civilian Life—Lieut. D. W. Bay has returned to his former position with the Hyatt Roller Bearing Co., Detroit. Mr. Bay served fifteen months in the Quartermaster Corps, Motors Division, department of production. Mr. Bay has charge of Illinois, Wisconsin and the Northwest, with offices in Chicago.

Robertson Joins Franklin Distributor—Maj. A. R. Robertson, for fifteen months a member of the American overseas air forces and who has just returned from France, has become associated with George Ostendorf, Buffalo, western New York distributor of Franklin motor cars. Major Robertson was formerly assistant general manager of the Houk Wire Wheel Co., of Buffalo.

New Battery Company Prospers—The Standard Storage Battery Co., Detroit, which was organized in October, 1918, by Carl J. Larsen and W. C. McNabb, has prospered to an unusual degree, and the company is planning to greatly increase its production. Original production plans called for 400 batteries a month and to handle local business, but new plans call for a national sales campaign.

Champion Ignition May Build—The Champion Ignition Co. may erect a new plant to care for its new business. The concern is producing 80,000 plugs a day and will run this production up to the 100,000 mark in March and 120,000 daily by early summer. During the war the company was busy on plugs for the Liberty and other aircraft engines, producing 40,000 of these plugs daily for the Government.

Camel Tire Co. to Expand—The Camel Tire Co., Toledo, Ohio, is opening a chain of branch stores, the first of which will be in South Bend, Ind. A. T. Fitzpatrick will have charge of organizing and opening these stores. He has secured locations in Springfield, Dayton and Columbus in Ohio; Jackson, Lansing and Battle Creek in Michigan, and Fort Wayne and South Bend in Indiana. He has been in the tire business ten years.

To Make Truck Units Only—Leicher Brothers, Loganville, Wis., who have been manufacturing truck units for passenger car chassis in connection with their public garage and repairshop business, have made arrangements to dispose of the garage and will build a \$15,000 shop to be devoted exclusively to making truck units at Loganville. William Hammermeister takes over the garage business. The new shop is expected to be ready about April 15.

Dealers to Erect Own Buildings—There is a dearth of motor buildings in Boston now. It is practically impossible to get a building where sales and service can be combined. When men seeking places who have taken on agencies go looking for locations the real estate men tell them they will build places on a ten-year lease, and they want an average of 50 cents a square foot for the floor space in a building. The Noyes-Bulck Co. has just bought a big tract on Commonwealth avenue for \$75,000, on which it will erect a big service station for G. M. C. trucks and a storage plant for its wholesale business in Buicks. The Buick-Boston Co. has bought property adjoining. The companies found this cheaper and more adaptable to their needs than to have structures built on leases.

From the Four Winds

Glimpses at the World of Motordom

TRUCK Brings Out Huge Load—A Federal 3½-ton truck, operated by Fred E. Edison, Hoquiam, Wash., recently brought out a log 90 in. at the butt, 86 in. at the top and 24 ft. long, containing 8480 feet B.M. of lumber, with a total weight upward of 8 tons. A trailer helped.

Buses Help Out Street Cars—Motor buses operated by Seattle, Wash., are a feature of the city's transportation service. These buses are to be operated in connection with the streetcar lines. This will enable the city to extend motor bus service to such sections as are not reached by the streetcar system. The method has been adopted by several cities to help solve transportation problems, especially in cities with municipally-owned car lines.

Planting Trees on State Highway—A bill is soon to be introduced into the New York state legislative body to urge the planting of shade trees and shrubs along the highways of the state. This bill is advocated by Dr. F. R. Smith, president of the New York state Motor Federation. In 1916 the State College of Forestry, believing that such a project was of great value to the state, brought the subject before the state motor federation. Owing to the outbreak of the war, plans for planting a 60-mile section of highway near Syracuse was abandoned. In the state there

are 150,000 miles of state and country roads suitable for the planting of shade trees. The sides of these would sustain the growth of 37,500,000 trees. It is believed this bill will receive favorable action from the state governing bodies.

Highways Save 1 Cent a Mile—Milwaukee county's concrete highways effect an economy of \$2,500 a day to users, according to statistics compiled by the county highway commissioner and based on an official census taken periodically during the last four years. Figuring that 25,000 vehicles of all kinds travel Milwaukee county highways each day, the saving is 1 cent a mile. The traffic census is made by selecting fifty-two points scattered throughout Milwaukee county. Seven counts are taken at each point, one for each day of the week. The days, however, are scattered throughout the year, from April to November, to arrive at average conditions. The statistics are taken to determine the durability of certain types of pavement according to the amount of traffic per square yard. The census figures show that traffic on county roads has increased on an average of 42 per cent per annum during the four years in which the survey was made.

Drastic Brake Ordinances Proposed—Convinced by observation that fully half the

motor accidents on the steep hills of Seattle, Wash., are due to brakes being out of order, a plan to overcome this danger has been prepared by R. E. Warren, United States safety engineer for the North Pacific district. It is proposed to enact an ordinance requiring a brake examination once a month; no charge when brakes are found in good condition; owner of car to receive a receipt showing date of inspection and also a small windshield stamp indicating that the car's brakes have been inspected. In case a car does not pass inspection the owner would be charged \$2 and given five days to correct the brakes, first offense; second offense, \$5. For failure to have car inspected, first offense, \$10; second offense, \$25; third offense, internment of the car for ninety days, inspections to be made by authorized garages in different parts of the city.

Some Are Still at Large—Some joker is at work in Maryland and some of his work reached the commissioner of motor vehicles. The work is under the guise of the Farmers' Anti-Automobile Protective Association and the wag sends the following:

The Farmers' Anti-Automobile Association has just held its convention and adopted the following code of ethics:

1—On discovering an approaching team the automobilist must stop offside and cover his machine with a tarpaulin painted to correspond with the scenery.

2—The speed limits on country roads this year will be secret and the penalty will be \$10 for every mile offender is caught going in excess of it.

3—In case an automobile makes a team run away, the penalty will be \$50 for the first mile, \$100 for the second mile, \$200 for the third mile, etc., that the team runs away in addition to the usual damages.

4—On approaching a corner where he cannot command a view of the road ahead the automobilist must stop not less than 100 ft. from the turn, toot his horn, ring a bell, fire a revolver, halloo and send up three bombs at intervals of 5 min.

5—Automobiles must be seasonably painted, that is, so they will merge with pastoral ensemble and not be startling. They must be green in spring, golden in summer, red in autumn and white in winter.

6—Automobiles running on the country roads must send up red rockets at night at every mile and then wait 10 min. for the road to clear. They must then proceed carefully, blowing their horns and shooting off roman candles.

7—All members of the society will give up Sunday to chasing automobiles, shooting and shouting at them, making arrests and otherwise discouraging them from touring on that day.

8—In case a horse will not pass an automobile, notwithstanding the scenic tarpaulin, the automobilist will take the machine apart as rapidly as possible and cancel the parts in the grass.

9—In case an automobile approaches a farmer's house when the roads are dusty, it will slow down to 1 m.p.h. and the chauffeur will lay the dust in front of the house with a hand sprinkler worked over the dashboard.

Coming Motor Events

SHOWS

Detroit	Automobile Dealers' Association	March 1-8
Quincy, Ill.	Automobile Trades Association, trucks and tractors	March 3-4
Columbus, Ohio	Automobile Show Co.	March 3-8
Richmond, Va.	Automobile Trade Association	March 3-8
Buffalo, N. Y.	Automobile Dealers' Association	March 3-8
Worcester, Mass.	Automobile Dealers' Association	March 3-8
Little Rock, Ark.	Automobile Dealers' Association	March 5-8
Dayton, Ohio		March 3-9
Philadelphia, Pa.	Automobile Trade Association, cars	March 8-15
Omaha, Neb.	Automobile Trade Association, automotive	March 10-15
Syracuse, N. Y.	Automobile Dealers' Association	March 10-15
Salt Lake City, Utah	Salt Lake Auto Show	March 10-15
Peoria, Ill.		March 12-15
Boston, Mass.	Automobile Dealers' Association, cars	March 15-22
Harrisburg, Pa.	Motor Dealers' Association	March 15-22
Peoria, Ill.		March 17-18
Philadelphia, Pa.	Motor Truck Association, trucks	March 17-22
St. Joseph, Mo.	Automobile Show Association	March 19-22
Brooklyn, N. Y.	Motor Vehicle Dealers' Association, cars	March 22-29
Warren, Pa.	Automobile Dealers' Association	March 22-29
Trenton, N. J.	Auto Trade Association	March 22-29
Pittsburgh, Pa.	Automobile Dealers' Association	March 22-29
Utica, N. Y.	Motor Dealers' Association	March 24-29
Brooklyn, N. Y.	Motor Vehicle Dealers' Association, trucks	April 1-5
Montreal, Canada	Soldiers' Wives' League	April 5-12
Bridgeton, Conn.	Automobile Dealers' Association	April 5-12
Deadwood, S. D.	Deadwood Business Club	April 8-12
Bristol, Va.		May 10-17

MEETINGS

Chicago	National Petroleum Congress	March 25-28
Hot Springs, Va.	Automotive Equipment Association	June 2-6

RACES

Santa Monica, Cal.	March 15
Los Angeles, Cal.	March 23
Indianapolis, Ind.	May 31
Uniontown, Pa.	July 19
New York	July 26
Elgin, Ill.	Aug. 22-23
New York	Aug. 23
Uniontown, Pa.	Sept. 1
New York	Sept. 20
Cincinnati, Ohio	Oct. 1